Prepared for:
The BNSF Railway Company
Seattle, Washington

Technical Specifications—Skykomish School HWF Remediation

Skykomish, Washington

Issued for Bid
Volume 1 of 2

FARALLON CONSULTING

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The BNSF Railway Company
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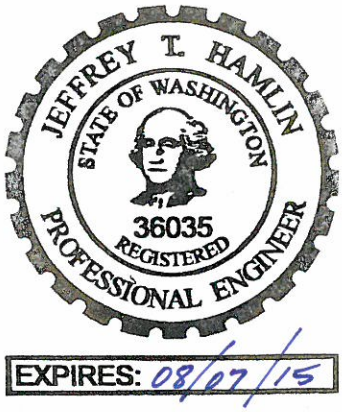
Technical Specifications—Skykomish School HWF Remediation

Skykomish, Washington



Prepared by Jeff Hamlin, P.E.

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BNSF – Skykomish School HWF Remediation
Technical Specifications

TABLE OF CONTENTS

BNSF – Skykomish School HWF Remediation
Technical Specifications

BNSF – Skykomish School HWF Remediation
Technical Specifications

BID FORM SCHEDULE A - SCHEDULE OF QUANTITIES AND PRICES

The Contract Unit Bid Prices listed in this Schedule are based on performance of the Project work as depicted in the Plans and Specifications of this bid package. The Contract Unit Bid prices shall include all overhead, profit, bonding and insurance, handling, storage, security, replacement if lost or damaged, and all other related charges. The actual quantities may be higher or lower than the estimated quantities provided herein. No adjustment of Bid prices will be allowed under this Contract by BNSF for any Bid Item due to any change in quantity. Please print unit price and total price very clearly. Signature below is acknowledgement of these conditions.

BNSF reserves the right to award Part A and Part B of the contract together to one contractor or separately to two contractors at the sole discretion of BNSF.

Item Number	Bid Item	Unit	Estimated Quantity	Unit Price	Total Price
	PART A – HWF FACILITIES INSTALLATION				
1	Mobilization, Demobilization, and Site Preparation	LS	1		
2	Temporary Construction Facilities and Controls, Erosion Control	LS	1		
3	Select Demolition - Exterior	LS	1		
4	Select Demolition - Interior	LS	1		
5	Select Demolition – Unknown Subsurface Structures	ALLOWANCE	1	$50,000	$50,000
6	Excavation, Transportation, and Stockpile of Clean Overburden	CY	2,800		
7	Excavation, Loading, and Transportation of Impacted Material	TN	2,500		
8	Oil/Water Recovery and Disposal	GAL	5,000		
9	Import and Place Structural Fill	TON	3,500		
10	Import and Place Stabilization Aggregate	TON	600		
11	Import and Place Pea Gravel Backfill	TON	1,000		
12	Sheet Pile Installation	LF	10,000		
13	Sheet Pile Installation Requiring Pre-Excavation	LF	2,500		
14	Sheet Pile to MSE Wall Grouting	LS	1		
15	Water Distribution System	LS	1		
16	Storm Drainage System	LS	1		
17	Sanitary Sewer System	LS	1		
18	Asphalt Concrete Pavement	TON	240		

19	Concrete Sidewalk	SY	160		
20	Treatment Area Cap	LS	1		
21	HWF System Installation – Subsurface	LS	1		
22	Restoration - Interior	LS	1		
23	Restoration - Exterior	LS	1		
24	Play Structure	ALLOWANCE	1	$50,000	$50,000
	Subtotal – Part A				
	Applicable Washington State Sales Tax				
	Total – Part A				
	PART B – HWF TREATMENT EQUIPMENT AND OPERATION				
1	HWF System – Equipment Fabrication and Delivery (Fall 2015)	LS	1		
2	HWF System – Equipment Fabrication and Delivery (Spring 2016)	LS	1		
3	Equipment Installation and Testing (Fall 2015)	LS	1		
4	Equipment Installation and Testing (Spring 2016)	LS	1		
5	Winter Operation (2015-2016)	DY	300		
6	HWF Operation (2016)	DY	60		
7	CWF Operation – With Chiller (2016)	DY	30		
8	CWF Operation – Without Chiller (2016-2017)	DY	275		
9	Equipment Decommissioning and Removal	LS	1		
10	GAC Change Out – Liquid Phase (2016)	EA	4		
11	GAC Change Out – Vapor Phase (2016)	EA	2		
	Subtotal – PART B				
	Applicable Washington State Sales Tax				
	Total – Part B				
	PART B – Additive Alternate Items				
1	HWF Operation (2017)	DY	60		
2	CWF Operation – With Chiller (2017)	DY	30		
3	CWF Operation – Without Chiller (2017-2018)	DY	275		
4	GAC Change Out – Liquid Phase (2017)	EA	4		
5	GAC Change Out – Vapor Phase (2017)	EA	2		
6	HWF Operation (2018)	DY	60		
7	CWF Operation – With Chiller (2018)	DY	30		
8	CWF Operation – Without Chiller (2018-2019)	DY	275		
9	GAC Change Out – Liquid Phase (2018)	EA	4		
10	GAC Change Out – Vapor Phase (2018)	EA	2		

11	HWF Operation (2019)	DY	60		
12	CWF Operation – With Chiller (2019)	DY	30		
13	CWF Operation – Without Chiller (2019-2020)	DY	275		
14	GAC Change Out – Liquid Phase (2019)	EA	4		
15	GAC Change Out – Vapor Phase (2019)	EA	2		
16	HWF Operation (2020)	DY	60		
17	CWF Operation –With Chiller (2020)	DY	30		
18	CWF Operation –Without Chiller (2020-2021)	DY	275		
19	GAC Change Out – Liquid Phase (2020)	EA	4		
20	GAC Change Out – Vapor Phase (2020)	EA	2		
	Subtotal – Part B Additive Alternate Items				
	Applicable Washington State Sales Tax				
	Total – Part B Additive Alternate Items				

NOTES:
LS = lump sum
LF = linear foot
GAL = gallon
CY = In-place cubic yard
TON = 2,000 pounds
SY = square yard
DY = one calendar day
MO = calendar month
EA = each

TOTAL PARTS A, B, and Additive Alternative Items:_____

TOTAL (WRITTEN):_____

CONTRACTOR ADDRESS:_____

_____

_____

CONTRACTOR AUTHORIZED SIGNATURE:_____

PRINTED NAME:_____

Title and Phone Number:_____

SCHEDULE B
LIST OF ADDENDA

List all Addenda received

SCHEDULE C

SCHEDULE OF MATERIALS – (VARIATIONS AND SOURCES)

VARIATIONS (Bidder shall list any proposed variations from the specified materials, subject to approval by Farallon):

_____

_____

_____

_____

_____

_____

_____

MATERIALS SOURCES (Bidder shall list sources of the following specified materials)

Backfill Material: _____

_____

_____

_____

_____

SCHEDULE D
LIST OF SUBCONTRACTORS

Provide the name of each Sub-subcontractor proposed for the Work, together with the amount payable to each Sub-subcontractor. Work that will be carried out partly or entirely by Bidder's own forces shall be indicated by "Own Forces."

TYPE OF WORK	**NAME AND ADDRESS**	**APPROXIMATE VALUE**

SCHEDULE E
LIST OF EQUIPMENT

On this form or Bidder's similar form, list all equipment that will be used in the performance of the Work. Such list shall show for each unit, the description of the unit, capacity, condition, age, present location, the name of the owner of the equipment, and all-inclusive hourly rental rates including operator. Such equipment shall be subject to inspection by the Owner or Engineer to verify the stated information. The equipment rates provided will be used the basis for payment of: 1) Time and Materials Work, and 2) Standby (downtime) that are deemed necessary by the Engineer for completion of the Work.

Description	Capacity	Condition	Age	Location	Owner	Hourly Rental Rate	Standby Rental Rate

SCHEDULE F
CONSTRUCTION MILESTONES

Bidder shall prepare an initial Progress Schedule, as described in Specification Section 01325, showing all activities and dependent operations such as plant and equipment mobilization and taking into account the Milestones listed below. The initial Progress Schedule shall be prepared with the assumption that hot water flushing treatment will end following one summer of treatment as shown below. However, additional treatment years may be required and construction milestones will be repeated for each treatment year.

The Bidder's initial Progress Schedule shall be provided in Bidder's Technical Execution Plan and shall include the following construction milestones.

Date	Event
01/22/15	Mandatory site walk
02/13/15	Deadline for submission of written questions before bid submittal
02/26/15	Bid Proposal due (4 pm PST)
03/06/15	Notice to Award
04/22/15	Notice to Proceed
05/06/15	Submit Technical Execution Plan
05/13/15	Engineer issues comments on Technical Execution Plan
05/20/15	Submit revised Technical Execution Plan
06/17/15	Start work on school property
08/21/15	Complete work on school property
10/15/15	Complete equipment installation required for subsurface and building interior monitoring.
04/01/16	Equipment units complete, inspected, and approved for delivery to site
05/15/16	Complete equipment delivery
06/01/16	Complete work required install and test equipment. Equipment operation, remote monitoring and control, confirmed operational and ready for start of hot water flushing operations.
06/17/16	Start hot water flushing operations.
08/15/16	Start cold water flushing operations.
06/17/17	Start hot water flushing operations.
08/15/17	Start cold water flushing operations.
06/17/18	Start hot water flushing operations.
08/15/18	Start cold water flushing operations.

BNSF – Skykomish School HWF Remediation

The Contractor shall comply with the Construction Milestones as provided below so as not to incur Liquidated Damages specified in Section 01250 – Contract Modification Procedures of the Specifications. The Liquidated Damages specified in the referenced section are based upon construction milestones listed in this Schedule.

	Milestone Activity		**Deadline**
1	Milestone 1 shall be Contractor's submittal of the Technical Execution Plan (TEP) in accordance with requirements of the Specifications.		14 calendar days after BNSF's issuance of Notice to Proceed (NTP).
1a	Milestone 1a shall be Contractor's re-submittal of the revised Technical Execution Plan (TEP) incorporating the Engineer's comments.		7 calendar days after receiving Engineer's comments on the Technical Execution Plan (TEP).
2	Milestone 2 shall be Contractor's start of work on school property.		Work on school property shall begin on 6/17/15.
3	Milestone 3 shall be Contractor's completion and Engineer's approval of all Work on the school property.		No Later Than 8/21/15
4	Milestone 4 shall be Contractor's completion and Engineer's approval of all Work required for equipment installation and startup of subsurface and building interior monitoring.		No Later Than 10/15/15
5	Milestone 5 shall be Contractor's completion and Engineer's approval of all Work required to fabricate treatment units off site and prepare for shipment.		No Later Than 4/1/16
6	Milestone 6 shall be Contractor's completion and Engineer's approval of all Work required to initiate continuous hot water flushing operations and start of flushing operations testing.		No Later Than 6/1/16
7	Milestone 7 shall be Contractor's start and Engineer's approval of hot water flushing operations.		No Later Than the day following the last day of classes for the Skykomish School District (June 17 for the 2014-2015 school calendar year. The school calendars are posted on the Skykomish School District web site.)
8	Milestone 8 shall be Contractor's start and Engineer's approval of cold water flushing operations.		No Later Than 8/16/16
	Milestones 7 through 8 shall be repeated for each year of treatment.		
9	Milestone 9 shall be Contractor's completion and Engineer's approval of all Work required to demobilize treatment equipment.		45 calendar days after completion of cold water flushing operations and Ecology approval of completion of treatment.

SCHEDULE G
LIST OF PERSONNEL

List the names of the principal personnel who will be assigned to the Work, including the superintendent, and their experience, and hourly billing rate (not pay rate). This information shall be for the use of BNSF, and all such additional personnel shall be subject to the approval of BNSF. The labor rates provided will be used as the basis for payment of: 1) Time and Materials Work, and 2) Standby (downtime) that are deemed necessary by the Engineer for completion of the Work.

NAME	POSITION	EXPERIENCE	STANDBY HOURLY RATE	OVERTIME HOURLY RATE

BNSF – Skykomish School HWF Remediation

SECTION 01110

SUMMARY OF WORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Defined Terms
B. Work Scope Summary
C. Work by Others
D. Work Sequence

1.02 DEFINED TERMS

Addendum: A written or graphic document issued to all bidders and identified as an addendum prior to bid opening that modifies or supplements the bid documents and becomes an integral part of the Contract.

Agreement: The Client Services Agreement between the BNSF Railway Company, the Owner, and the selected Contractor that will be used as the contract for the Work.

Application for Payment: The form, set forth in the Bidding Documents and accepted by the Owner and the Engineer, that is used by the Contractor to request a progress or final payment and that is accompanied by supporting documentation as required by the Contract Document.

APWA: American Public Works Association.

AREMA: The American Railway Engineering and Maintenance-of-Way Association.

Award: A formal decision by the Owner and Engineer to accept a responsible and responsive bidder for the work.

Bid: The offer of a bidder on a properly completed proposal form to perform the contract.

Bid Form: The form provided within the general contract document and including Schedules A through G thereto that are an integral part of the Contract.

Bid Item: An element of work, a component of the contract work, with title, unit of measure, quantity, and the Contractor's proposed unit price described in the Contract Plans and Specifications.

Bidder: An individual, partnership, firm, corporation, or joint venture, submitting a proposal or bid. When required by the Owner, prequalification shall be enacted.

Bid Documents: The component parts of the proposed contract that may include, but are not limited to, the proposal form, the proposed contract provisions, the proposed contract plans, specifications, addenda, and subsurface boring logs (if any).

CAP: Cleanup Action Plan. Appendix B of the Consent Decree. Available on-line:

http://www.ecy.wa.gov/programs/tcp/sites/bnsf_sky/bnsf_sky_new/Legal_Information.htm#Final%20Consent%20Decree

CDL: Construction and Demolition Landfill.

Change Order: A legal instrument, authorized by the principals of the contract, created to change contract item quantities or other alteration to the work. Such a change does not invalidate the contract or release the surety. The Contractor agrees to perform the work as altered. Such a change may include deletion of any part of the work, increasing or decreasing material quantities; altering specifications, design, or both; altering the way the work is to be done, adding new work, altering facilities, equipment, materials, services, or sites, provided by the Owner; directing the Contractor to speed up or delay the work.

Confirmation Sample: Sample of soil obtained from floor or wall of an excavation, or water from dewatering or decontamination, that will be sent to an outside or on-site analytical laboratory to determine whether the sample meets applicable requirements.

Consent Decree: Washington State Department of Ecology v. BNSF Railway Company, King County Superior Court Case No. 07-2-33672-9 SEA. Available on-line:

http://www.ecy.wa.gov/programs/tcp/sites/bnsf_sky/bnsf_sky_new/Legal_Information.htm#Final%20Consent%20Decree

Contract: A written, legal, binding agreement between an Owner and a Contractor, describing, among other things, work to be done and by whom; who provides labor, equipment, and materials; and how compensation will be made. The Contract includes the contract (general agreement) form, the bidder's completed proposal form, contract provisions and specifications, standard specifications, standard plans, addenda, various certifications and affidavits, supplemental agreements, change orders, and subsurface boring reports (if any).

Contract Documents: The Contract Documents include the Agreement, Bid Form, the Proposal, Schedules A through G, the Project Plans and Specifications, any properly executed Change Order and Work Change Directive or Addendum pertaining to Work set forth in the Specifications or Change Orders.

Contractor: The person, firm, or corporation with whom the Owner has entered into a legal agreement for performance and compensation of the work described in the Plans and Specifications.

Contract Price: The amount payable to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement.

Contract Time: The time period stated in the Contract Document for completing the Work described by the Plans and Specifications.

CWF: Cold Water Flushing.

Daily Construction Report: The Contractor's Daily Construction Report described in Specification Section 01325 Progress Schedules and Reports.

Decontamination Zone: A transition area between the Exclusion Zone(s) and the Support Zone(s) or other non-exclusion areas of the Secured Zone(s) wherein impacted soil and other undesirable materials can be cleaned from personnel and equipment.

Disturbed Areas: Areas disrupted or otherwise changed from their preconstruction condition by the construction activity.

Downtime: Contractor's downtime during the construction period will be paid based on the equipment and personnel present at the site and the downtime rates as presented by the Contractor in Schedules E and G of the Specifications.

Engineer: Farallon Engineer authorized by the Owner, BNSF Railway Company, to monitor the Contractor's Work for conformance with the Plans and Specifications. The terms Engineer and Farallon are used interchangeably in these Plans and Specifications.

Engineer's HASP: The site-specific Health and Safety Plan prepared by the Engineer.

Exclusion Zone: A delineated area, containing impacted materials and other potential threats to human health and safety, with controlled access within the secure zone.

Farallon Consulting, L.L.C. (Farallon): designated Engineer, selected by BNSF Railway Company, Owner, to coordinate the project design, remediation activity, and construction management of the remediation project.

Form: A legal form provided by the Owner and Engineer requiring the signatures of the legal representatives of the Contractor and the Owner in order to effect the formal execution of a contract.

Force Account Work: In the event work is made necessary by changes and alteration to plans or other reasons, or any other work that is performed that is not specified by these Plans and Specifications, such work shall be designated "Force Account Work." The Contractor shall perform such force account work in accordance with these Specifications and as directed by the Engineer. No such force account work shall be undertaken by the Contractor until a written order has been issued by the Engineer to perform the Work on a "Force Account" basis. Used interchangeably with Time and Materials work in these Specifications.

HASP: The site-specific Health and Safety Plan prepared by the Contractor described in Specification Section 01150 Health and Safety.

HAZWOPER: Hazardous Waste Operations and Emergency Response as defined in 29 CFR 1910.120.

HDPE: High Density Polyethylene.

Health and Safety Officer: The Contractor's Health and Safety Officer described in Specifications Section 01150 Health and Safety.

HWF: Hot Water Flushing.

Impacted: A geographic area, an object, or a material that is or that has been in contact with, or that contains a substance at concentrations exceeding applicable health standards and guidelines for that substance.

Impacted Soil or Water: Sediment, soil, or water determined to contain chemical constituents at concentrations exceeding applicable health standards and regulatory guidelines.

Invitation to Bid: Notice soliciting proposals or bids for work stating, among other things, the time, place, and date for receiving and opening the bids.

Issuing Office: The office of Farallon from which the Bidding Documents are issued and where the bidding procedures are to be administered as identified herein:

Farallon Consulting, L.L.C.
975 5th Avenue Northwest
Issaquah, Washington 98027
Attn: Mr. Jeff Hamlin, P.E.
Phone: (425) 295-0800

Laws and Regulations: The Contractor shall always comply with all Federal, State, County, Tribal, local laws, ordinances, and regulations that affect work under contract. The Contractor shall indemnify, defend, and save harmless the Owner, agents of the Owner, the State, County, Town officers and agents against any claims that may arise because the Contractor (or any employee of the Contractor, subcontractor, or material person) violated a legal requirement.

MTCA: Model Toxics Control Act.

MSE: Mechanically Stabilized Earth.

NMFS: National Marine Fisheries Service.

Notice of Non-Conformance: A written advisory that directs the contractor to repair or correct a deficient contract item of work or material.

Normal Work Hours: The hours during which the Contractor may perform the physical work of the Contract as authorized in the Specifications.

NWDZ: Northwest Developed Zone as defined by the Consent Decree. The entire excavation area is within the NWDZ.

Owner: BNSF Railway Company (BNSF).

Plans: The Plans show the scope, extent, location, dimensions, and character of the work including layouts, profiles, cross-sections, and other details, to be furnished and performed under this Contract and that have been prepared and approved by the Engineer and are included within or are referenced in the Contract Documents. Shop Drawings are not so defined.

Project: The environmental remediation of the spill in Skykomish, Washington, described by these Plans and Specifications.

Project Records: The documentation described in Specification Section 01325 Progress Schedules and Reports, verifying the Project Work and Compensation required for a formal audit.

Progress Schedule: The time-based depiction of all the Project Construction Activity and Tasks listed logically to show the beginning and ending of the Project Work and as noted in Section 01325 Progress Schedules and Reports.

Project Superintendent: The Contractor's supervisor described in Specifications Section 01310 Project Management and Coordination; a person of wide experience and knowledge of construction methods and measures and authorized by the Contractor Owner to fully decide construction issues for the Company.

PSCAA: Puget Sound Clean Air Agency.

Remediation: Activity described by these Plans and Specifications, approved by the Washington State Department of Ecology and BNSF, and performed by the selected Contractor to remove or mitigate hazardous and non-hazardous substances in the site soil, sediment, and groundwater.

Request for Information (RFI): Formal request for information prepared by the Contractor to document and receive clarification, direction, or further explanation from the Engineer regarding the Contract Plans and Specifications and work.

Samples: Small physical examples of materials, equipment, or workmanship that are representative of a portion of the work and that, along with other factors, establish the standard by which such portion of the work is evaluated.

Schedule of Quantities and Prices: The Schedule of Quantities and Prices as defined in paragraph 1.02 (A) of Section 01290 Payment Procedures of the Specifications.

Schedule of Values: A listing of the contract items of work, the appropriate quantities, along with the individual unit and total price.

Secured Zone: The area(s) where the Contractor shall perform the Work and wherein the Contractor has primary responsibility for the operation, security, and safety of materials, equipment, and project personnel.

Site Construction Manager: The assigned representative of the Engineer tasked with construction oversight of a portion or the complete Project.

SVE: Soil vapor extraction.

Specifications: The portion of the Contract Document that denotes the technical descriptions of materials, equipment, standards, workmanship, measurement, and payment as applied to the work, material, proposal, and Contract Items.

SSHO: The Contractor's site Safety and Health Officer.

Sub-Contractor: An individual, partnership, firm, corporation, or joint venture who is sublet part of the contract by the Contractor.

Submittals: Formal information related to material, subletting, contract work details, provided by the Contractor to the Engineer for review for approval for the Contract. Further description is located in the Specifications including, but not limited to, Section 01330 Submittal Procedures.

Substantial Completion: Substantial Completion will be declared by the Engineer when all on-site Project work is complete except for demobilization and contract closeout.

Successful Bidder: The Bidder to whom the Owner (on the basis of the Engineer's evaluation as herein provided) awards the contract for the Work.

Supplier: A manufacturer, fabricator, supplier, distributor, material person, or vendor having a direct contract with the Contractor or with any Sub-Contractor to furnish materials or equipment to be incorporated in the Work by the Contractor or any Sub-Contractor.

Support Zone: Designated area within the Secured Zone that contains no impacted materials or hazards.

Technical Execution Plan: A written work plan that describes methods, materials, and sequences of specific work items submitted by the Bidder in accordance with the requirements of the Bidding Documents, reviewed by the Engineer, and subsequently modified by the Contractor in accordance with the Contract Documents.

Temporary Activity Zone: A marked area within the Exclusion Zone where an activity occurs or structure may exist that warrants separation or demarcation from other activities or areas.

Time and Materials: Used interchangeably with Force Account Work in these Specifications.

Underground Facilities: All pipelines, conduits, ducts, cables, wires, manholes, catch basins, vaults, tanks, tunnels, or other such utilities or attachments, and any encasements containing such facilities that have been installed underground.

Weekly Progress Meetings: The Weekly Progress Meeting referred to in Specifications Section 01325 Progress Schedules and Reports.

Work: The completion of tasks described by the Plans, Specifications, and Proposal herein by furnishing labor, equipment, and materials in conformance with the Contract Documents.

Work Change: The Work Change Directive, described in Section 01250 Contract Modification Procedures, generated to add, subtract, modify, or authorize work for a heretofore unforeseen condition, material, or requirement. This allows expeditious progress in contract work while waiting to accumulate several work items in a formal change order.

Work Zones: Areas of the site where work is segregated by HAZWOPER classification of work conducted. Work zones include but are not limited to the Decontamination Zone, Exclusion Zone, Secured Zone, Support Zone, and Temporary Activity Zone.

WISHA: Washington Industrial Safety and Health Act.

WSDOE (or Ecology): Washington State Department of Ecology.

WSDOT: Washington State Department of Transportation.

1.03 WORK SCOPE SUMMARY

A. The scope of work described in these plans and specifications is a part of the BNSF Former Maintenance Facility cleanup in Skykomish, Washington. The Skykomish School HWF Remediation is a component of an integrated and comprehensive remedial action for the site in accordance with the requirements of the Cleanup Action plan prepared by the Washington State Department of Ecology.

B. The scope of work for the Skykomish School HWF Remediation includes construction of a sheet pile enclosed treatment area, construction of a geomembrane cap, installation of injection, extraction, and monitoring wells, installation of treatment equipment and controls, and operation of the treatment equipment.

C. The contract is divided into two parts; Part A – HWF Facilities Installation, and Part B – HWF Treatment Equipment and Operation. Part A of the contract covers site preparation, installation of the sheetpile barrier wall, in-situ grout connection of the sheetpile wall to an existing MSE wall, installation of the treatment area cap, installation of heated water injection and groundwater extraction wells, installation of SVE wells and

laterals, installation of a treatment area cap, installation of oil skimmer vaults, installation of piping and control conduits, preparation of the treatment facility site, building restoration, and site restoration. Part A also includes excavation of an area of contaminated soil south of the school building on Railroad Avenue.

D. Part B of the contract covers installation, startup, and operation of the treatment system equipment and controls required for subsurface and building interior monitoring, CWF operations, and HWF operations with continued operations until treatment is determined complete.

E. The general project scope includes the following work elements:

Part A – HWF Facilities Installation

1. Preparation, submittal, and implementation of a Technical Execution Plan (TEP);
2. Preparation, submittal, and implementation of a project Health and Safety Plan;
3. Construction of temporary erosion and sediment control elements;
4. Installation of temporary construction fencing to safeguard active work areas, and implement pedestrian and traffic control plans;
5. Installation, maintenance, and performance of all geotechnical monitoring facilities;
6. Coordination with the utility companies;
7. Excavation, stockpiling, and backfilling of clean overburden;
8. Excavation and transport of TPH-impacted soils removed from the defined excavation boundaries; recovery and disposal of oil from the excavation area;
9. Supporting the Engineer in collecting soil samples within the excavation areas, and confirmation samples from excavation sides and bottoms;
10. Performance of additional excavation as required by the Engineer to complete excavations to meet cleanup levels;
11. Demolition of improvements within the treatment area;
12. Disassembly and removal of playground equipment;
13. Installation of a sheet pile wall around the treatment area;
14. Installation of water injection wells, groundwater extraction wells, SVE wells and laterals, and other hot water flushing system components within the treatment area;
15. Coordination of system installation components with the Part B – HWF Treatment Equipment and Operation Contractor (as required);
16. Installation of a treatment area cap;
17. Grading, surface preparation, and fencing of a treatment equipment area;
18. Re-routing and upgrading existing utilities;
19. Backfilling and compaction of excavated areas with clean overburden and imported backfill materials;
20. Maintaining utility service to the school and teacherage during construction;
21. Restoration and finishing of interior structures and facilities;
22. Final restoration and landscaping of disturbed areas;
23. Preparation and submittal of as-built drawings, certifications and material requirements, schedules, record plans, quality control documentation, and other submittals as identified in various sections of the Specifications.

Part B – HWF Treatment Equipment and Operation

1. Coordinating with the Part A – HWF Facilities Installation Contractor to assure Part A facilities are installed in a manner acceptable for equipment installation and operation.
2. Subsurface and building interior condition monitoring equipment supply and installation;

3. Pump and control supply and installation;
4. Oil skimmer equipment supply and installation;
5. Control and power systems wiring;
6. Treatment enclosure fabrication;
7. Equipment setup;
8. System commissioning;
9. Yearly system operation for the duration required to achieve treatment goals; and
10. System decommissioning.

B. The work is being implemented in accordance with the Washington Administration Code (WAC) 173-340-400 – Implementation of the Cleanup Action. The primary governing agency is the Washington State Department of Ecology, Northwest Region Office in Bellevue, Washington. Federal agencies, Washington state agencies, King County, and the Town of Skykomish are additional agencies that have jurisdiction over certain aspects of the anticipated activity.

1.04 WORK BY OTHERS

A. The Engineer will collect and analyze soil and water samples as described in the Specifications. The Contractor shall aid in collection of samples as described in the Specifications.

B. The Engineer will perform air monitoring required for worker health and safety requirements of Farallon employees and for the general public during the additional work. The Engineer will not perform air monitoring required for worker health and safety requirements for the Contractor's employees and sub-contractors.

C. The Engineer will perform soil sampling and analysis required for the off-site disposal of contaminated excavated soil and debris. The Contractor shall be responsible for all other testing related to off-site disposal of debris or water.

D. The Owner will provide for laboratory analytical services at an off-site laboratory.

E. Power service to the school provided by Puget Sound Energy lies within the excavation area. The Contractor shall coordinate with Puget Sound Energy to facilitate temporary relocation of the power service and re-installation of the power service as required to complete the work.

F. Final restoration of the site shall include removal of the sheet pile containment walls, removal of the geomembrane cap, removal and/or abandonment of wells and associated piping, and ultimate restoration of pavements and landscape surfaces. Final restoration of the Site will be completed by others following resumption of cleanup operations at a future unspecified date.

1.05 WORK SEQUENCE

A. The Contractor shall determine detailed sequencing of the Work in accordance with the Plans, Specifications, and Addenda, and the Construction Milestones set forth in Bid Form Schedule A. This schedule shall be subject to review and approval by the Engineer prior to starting any Project site activity.

B. The Contractor shall describe the construction sequence in their Technical Execution Plan (TEP) for the additional work and approved by the Engineer and the School District.

The TEP shall be prepared as described in the Specifications Section 01330 Submittal Procedures, paragraph 1.05.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION 01110

BNSF – Skykomish School HWFC Remediation

SECTION 01140

WORK RESTRICTIONS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Use of Premises
B. Access Roads
C. Parking
D. Work Hours
E. Railroad Safety Requirements
F. Restrictions on Air Emissions of Toxic Chemicals
G. Protection of Existing Utilities

1.02 USE OF PREMISES

A. The Contractor shall confine all operations, including storage of material and equipment, to the pre-approved areas of the Project site as approved in writing by BNSF and the Engineer. All imported backfill material requiring temporary storage shall be temporarily stockpiled in the Soil Handling Area within the BNSF rail yard or areas approved by the Engineer. The Contractor shall be responsible for use of any stockpiling areas off-site and not designated on the Plan including coordination and fees for such an arrangement. BNSF and the Engineer's prior written approval shall be required for use of any BNSF or public right-of-way for a staging or stockpiling area. The Contractor shall not trespass or encroach upon any right-of-ways or any areas where access is not available during the work activities and shall be completely responsible for any damages or liabilities that may result due to access of such right-of-ways and areas.

B. Prohibited activities anywhere on School Property include:

1. Storing or accumulating hazardous substances not directly related to cleanup described in the Plans and Specifications.
2. Use of tobacco or alcohol.
3. Permitting any contact between school children and any employee who has pled or been convicted of any felony crime involving the physical neglect of a child under Chapter 9A.42 RCW, the physical injury or death of a child under Chapter 9A.32 RCW or Chapter 9A.36 RCW (except motor vehicle violations under Chapter 46.61 RCW), sexual exploitation of a child under Chapter 9A.68A RCW, sexual offenses under Chapter 9A.44 RCW where a minor is a victim, promoting prostitution of a minor under Chapter 9A.88 RCW, the sale or purchase of a minor child under 9A.64.030 RCW, or violation of similar laws of another jurisdiction. BNSF will remove from the work site any employee, representative, contractor, or subcontractor who has engaged in such actions.
4. Harassing, intimidating, having physical contact with or engaging in other physical contact or communication of a sexual, intimidating or harassing nature with students. The Contractor shall remove from the School Property, and prohibit from working on this project, any employee, representative, contractor, or subcontractor who has engaged in such actions.

5. Storage of fuel.

Any violations of the activities listed above will be grounds for termination of the contract.

C. All site workers will be required to participate in the BNSF e-RailSafe program, including required background checks. Contractor workers shall display the BNSF issued e-RailSafe photo ID when working on BNSF or School property. Grounds for site access denial include:

a. A felony conviction within past 7 years;
b. Incarceration within the past 5 years;
c. An active warrant;
d. An open felony court case; and
e. Fraud Alert (Social Security Number Discrepancy).

D. The Contractor shall be responsible for the security and safety of Contractor's equipment, materials, and facilities. Neither BNSF nor the Engineer will be liable for loss or damage of Contractor's tools, vehicles, equipment, or materials, regardless of the cause. The Contractor shall retain sole and complete responsibility for the Project work and materials as described in the Plans and Specifications until BNSF issues the Final Acceptance Notice.

E. The Contractor shall be completely and solely responsible for any damage to roadways, facilities, utilities, trees, project structures, school property, and private properties that results from negligence, carelessness, actions, errors or omissions by the Contractor.

F. Prior to School interior construction the Contractor shall move School furniture and appurtenances as needed to a pre-approved location within the School. Furniture and appurtenances shall be maintained in its original condition during Construction. Prior to Substantial Completion the Contractor shall return appurtenances to original location, as documented in pre-construction video survey as specified in Section 01500 – Temporary Facilities.

G. The Contractor shall provide unrestricted access to School interior for custodial and maintenance workers two weeks prior to Completion of Work on School Property, as specified in Schedule A.

H. The Contractor shall provide and coordinate access to the School for School staff and contractors as required during the duration of the construction. Where School staff and contractors require access to areas of active construction the Contractor shall provide training, escorts, and PPE as required.

1.03 ACCESS ROADS

A. Contractor vehicles shall enter and exit the work-site and Project only at locations designated on the Plans or as otherwise approved in writing by the Engineer.

B. The Contractor shall provide all traffic control flagging staff, temporary signals, and signage as necessary to maintain pedestrian and traffic control as depicted on the approved updated Traffic Control Plan, to be provided by the Contractor, and as required

by applicable King County and Town of Skykomish ordinances, and as deemed necessary by the Engineer for safe traffic flow on public streets and/or for street closures required to conduct the Project work.

C. The Contractor shall provide all barricades, temporary signals, and signage for streets that are closed or rerouted during the execution of the work. The Contractor shall submit an updated Traffic Control Plan to the Engineer for approval prior to starting the additional Project work. The updated Traffic Control Plan shall be developed by a Traffic Control Supervisor (TCS) retained by the Contractor with sufficient experience and expertise, including work near rail tracks, to provide a safe work environment for the Town and for the Project. No Project street work will be permitted until approval is granted for the Traffic Control Plan. All traffic control work including signage and traffic markings shall conform to the United States Department of Transportation Manual on Uniform Traffic Control Devices (MUTCD) as well as applicable King County and Town of Skykomish ordinances.

D. Emergency vehicles shall be allowed ready access at all times during the Project.

E. The Contractor's TCS shall communicate and coordinate, with the School District, Emergency Vehicles, the Fire and Sheriff Departments, and with BNSF. Original copies of the daily TCS report, describing all traffic control activity and communication, shall be furnished to the Engineer weekly.

F. The Contractor shall coordinate emergency response procedures with the School District consistent with the School emergency response planning.

1.04 PARKING

A. The Contractor shall park construction vehicles and construction equipment only in areas designated for such purpose as approved in writing by the Engineer.

B. Contractor employees shall park personal vehicles only in the designated employee parking area, as shown on the Plans or as otherwise approved in writing by the Engineer.

C. Vehicles shall not be parked in any locations where they impede traffic or access to areas where work is underway.

D. Contractor vehicles and Contractor employee vehicles shall not be parked on Sixth Street on School property, or road shoulders adjacent to School Property. Contractor shall coordinate with School and Engineer for parking vehicles near School property.

E. There shall be no parking on BNSF right-of-way. The ONLY exception is that area fenced off and holding the Project field office trailers south of the railroad tracks or as designated on the drawings or approved in writing.

1.05 WORK HOURS

A. Project work hours shall be 7:00 a.m. to 7:00 p.m. Monday through Friday and 9:00 a.m. to 7:00 p.m. on Saturday. Working on Saturdays shall be requested by the Contractor and approved in writing by the Engineer. Holidays are excluded except as approved in

advance by the Engineer. Excessive noise, such as banging dump truck tailgates while unloading, sliding steel sheets across pavement, jackhammers, hydraulic hammers, concrete saws, pipe saws, etc. may require altering work hours or adjusting use of noise generating machinery. The Engineer will review to make a determination of excessive noise restrictions for the Project. The Contractor shall comply with the noise control ordinance issued by the Town of Skykomish and King County.

B. Contractor's maintenance on project-related equipment may be done outside Project work hours with adherence to safety and noise constraints at no extra cost to BNSF or the Engineer.

C. Any deviation from the published Project work hours, whether proposed for weekends or holidays or for work at night, will be subject to prior approval by the Engineer. The Contractor shall submit a request to the Engineer no less than 48 hours, i.e., two work days, prior to requesting any necessary variation from the normal work hours, in order to allow sufficient review and coordination with staff. Any such Contractor request to the Engineer shall include work activities to be conducted outside of normal working hours, the hours, traffic control and safety issues addressed, and days needed for the activity. Any such approval by BNSF and the Engineer will solely be for the convenience of the Contractor and no further compensation, except for Contract Items, will be made including but not limited to acceleration. If BNSF and the Engineer determine that acceleration is needed, such effort will be amended to the Contract via a negotiated change order.

1.06 RAILROAD SAFETY REQUIREMENTS

A. All personnel, including, but not limited to, operators, laborers, traffic control staff, contractor staff visitors, working on the Project within the railyard shall take and pass the BNSF rail safety course (http://www.contractororientation.com/) as well as the e-SAFE Homeland Security program (http://www.e-railsafe.com/). Information is available on the above websites. This requirement will be strictly enforced. Project safety and Homeland Security measures are absolute requirements.

B. In accordance with BNSF right-of-way rules, all Project staff shall wear appropriate safety gear, including a clean, reflective vest, steel-toed boots (safety boots) in accordance with ANSI Z41.1, safety glasses with side guards, and hard hat at all times while on the Project. The sole exception to this absolute requirement shall be when in the field office or in an enclosed vehicle. Non-conformance to this requirement shall subject the violator to dismissal from the Project.

1.07 RESTRICTIONS ON AIR EMISSIONS OF TOXIC CHEMICALS

A. The Contractor shall responsibly perform all Project work concerning airborne emission of toxic chemicals in accordance with all related laws and regulations and these Plans and Specifications.

B. The Contractor shall perform all work in accordance with the requirements of the Washington State Department of Ecology and Puget Sound Clean Air Agency Regulations and as described by these Plans and Specifications.

C. The Engineer shall have authority to direct the Contractor to stop work or to modify work methods or activities as necessary to comply with Ecology's Action Levels for airborne emissions of toxic chemicals. If the Engineer determines that modifications of work methods or activities affect the contract work, and that the airborne emission is not caused by easily changeable work activities, force account procedures, as fairly negotiated by the Construction Manager and Contractor Superintendent, will be implemented until the Action Levels safe zone is restored.

D. The Contractor shall maintain current copies of all Material Safety Data Sheets (MSDS) for any chemicals delivered and stored on the project site. Copies of current MSDSs for materials delivered and stored on the project site shall be provided to the Engineer and School.

1.08 PROTECTION OF EXISTING UTILITIES

A. The Contractor shall protect all overhead and underground private and public utilities, including the BNSF railyard properties, from damage resulting from Project work. Among others, these utilities include, but are not limited to: telephone, communication lines, power lines, sewer and water lines, railroad tracks and equipment, and street lighting and signage.

B. The Contractor shall perform a rigorous utility locate of School build interior subsurface utilities before beginning any intrusive construction. Excavation within 24 inches of interior utilities shall be done by hand or by air knife. Any damaged utilities will be repaired immediately to maintain service within the School.

C. If there is a discrepancy in the proposed work related to existing utilities, the Contractor shall notify the Engineer in writing and resolve it before proceeding with the work.

D. Chapter 19.122 of the Revised Code of Washington (RCW) relates to underground utilities. In accordance with this RCW, the Contractor shall call the One-Number Locator Service, i.e., 1-800-424-5555, for field location of utilities. The Contractor shall call the BNSF Call Before You Dig number (800-533-2891) for field location of utilities on the railyard. If no locator service is available for the area, notice shall be provided individually to those owners of utilities known to, or suspected of, having underground facilities within the area of the proposed excavation.

E. The Contractor shall cooperate with any utility activity to move, relocate, repair, or connect their equipment.

F. In some cases, the Plans may not show all underground facilities. Should the work require these to be moved, the Engineer will provide for other to move them or issue a change order requiring the Contractor to do so pursuant to these Contract Documents and Standard Specifications, unless it is otherwise noted elsewhere in the Plans and Specifications.

G. All costs associated with coordinating, cooperating, and scheduling with utilities shall be included as incidental to the various other Contract Bid Items.

H. Any interruptions to utility service must be submitted to the Engineer for approval no less than 24 hours prior to the utility interruption.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 01150

HEALTH AND SAFETY REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. References
C. Contractor's Responsibility for Health and Safety
D. Submittals
E. Notifications
F. Equipment and Facilities
G. Personal Protective Equipment
H. Other Health and Safety Equipment
I. Worker Qualification
J. Work Planning and Meetings
K. Engineering Controls
L. Monitoring
M. Evaluation of Performance
N. Job Safety Analysis Form

1.02 SUMMARY

A. This section includes requirements for Health and Safety during performance of Work, including identification of applicable Laws and Regulations, Submittals, notification requirements, and Health and Safety execution Specifications.

1.03 REFERENCES

A. Applicable regulations and publications include, but are not limited to, the following:

1. ACGIH, Threshold Limit Values and Biological Exposure Indices (most recent version).
2. ANSI, Emergency Eyewash and Shower Equipment, Z358.1, 1981.
3. ANSI, Practice for Occupational and Educational Eye and Face Protection, Z87.1, 1979.
4. ANSI, Practices for Respiratory Protection, Z88.2, most recent version.
5. ANSI, Protective Footwear, Z41.1, 1983.
6. ANSI, Respirator Use Physical Qualification for Personnel, Z88.6, 1984.
7. Code of Federal Regulations (CFR): Title 29 CFR Part 1904, Recording and Reporting Occupational Injuries and Illnesses; Title 49 CFR Part 171, General Information, Regulations, and Definitions; and Title 49 CFR Part 172, Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
8. DHHS, "Manual of Analytical Methods," 3rd edition Volumes I and II, DHHS (NIOSH) Publication 84-100.
9. Federal DOT Standards and Regulations, 49 CFR 171 and 49 CFR 172.

10. Model Toxics Control Act (MTCA), Chapter 173-340 Washington Administrative Code.
11. NFPA, Flammable and Combustible Liquids Code, NFPA 30, most recent revision.
12. NIOSH Pocket Guide to Chemical Hazards, DHHS/PHS/CDC/NIOSH, June, 2000 or most recent.
13. NIOSH/OSHA/USCG/USEPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, DHHS/PHS/CDC/NIOSH, October 1985.
14. OSHA, Title 29 CFR Part 1910, Occupational Safety and Health Standards, and Title 29 CFR Part 1926, Safety and Health Regulations for Construction Sites.
15. Railroad Workplace Safety, 49 CFR 214.
16. USDOT Standards and Regulations, 49 CFR 171 and 49 CFR 172.
17. USEPA, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA/625/R-96/010b, January 1999.
18. USEPA, Health and Safety Requirements for Personnel Engaged in Field Activities, USEPA Order No. 14402.
19. USEPA, Standard Operating Safety Guidelines, November 1984.
20. WISHA, Chapter 296-800 Washington Administrative Code.

B. Where two or more regulations/documents conflict, the one(s) offering the greatest degree of protection shall apply.

1.04 CONTRACTOR'S RESPONSIBILITY FOR HEALTH AND SAFETY

A. The Contractor shall comply with any and all state, federal, and local ordinances, Laws and Regulations.

B. The Contractor shall establish and maintain control of the construction site and shall be responsible for the Health and Safety of the Contractor's employees, their Subcontractors, Suppliers, agents, inspectors, visitors, School staff, the general public, and any others associated with or interacting with the Contractor who provides labor, goods, or other services on the Site.

C. The Contractor shall be responsible for emergency response planning and notification, and for actual response to any and all emergencies that may occur during the course of the Work, including emergencies that may occur when the Contractor is not present at the Site. Emergency planning and notification shall include coordination with the School and be consistent with existing School emergency planning provisions.

D. The Contractor is responsible for communicating daily with the Engineer regarding Health and Safety issues for the Engineer's safe conduct of the Engineer's duties, but such communication shall not imply any duty or responsibility on the part of the Engineer with regard to Health and Safety of the Contractor's employees, its Subcontractors, Suppliers, the general public, or others. The Engineer's responsibility and duty with regard to Health and Safety shall be limited to the Engineer's employees. The Contractor shall have responsibility and duty to the Engineer to communicate Health and Safety issues accurately and in a timely manner to allow the Engineer to take appropriate actions to protect the Engineer's employees and the Owner's employees.

E. The Contractor shall designate a dedicated Contractor's SSHO on the Site during the Work who shall, at a minimum, have at least one (1) year of experience as an SSHO on an uncontrolled hazardous waste site, and have 40-hour OSHA Hazardous Waste Operations training and 8-hour OSHA Supervisor training. Tenure of Contractor's SSHO shall be subject to approval by the Engineer; such approval will not be unreasonably withheld.

F. The SSHO shall enforce the requirements of safety for all Contractor personnel onsite at all times. The SSHO shall ensure that all Contractor personnel, Subcontractor personnel, and Contractor visitors, follow the applicable site Health and Safety Plan (HASP), including wearing the designated level of Personal Protective Equipment (PPE). If the SSHO elects to require a higher level of protection than that specified in the Engineers HASP, the extra costs associated with such higher level shall be borne by the Contractor, unless such extra costs are approved in advance in writing by the Engineer.

G. Prior to mobilization and continually through the duration of the Work, the SSHO shall inspect the Site and document area-specific and worker-specific protection requirements.

H. After mobilization, the SSHO shall monitor activities and shall document the need for additional worker protection as required, based on activities performed and Action Levels specified in the HASP.

I. The SSHO shall verify that all activities are performed in accordance with the HASP and all federal, state, local, and Health and Safety standards, Laws and Regulations, and guidelines.

J. In the event of a health or safety risk, as determined by the SSHO or by other Contractor personnel or by the Engineer, the Contractor shall not proceed with the Work until a method for handling the risk has been determined in consultation with the Engineer and implemented. Any health or safety risk resulting in a stoppage of Work shall be reported immediately to the Engineer.

K. The Contractor shall be responsible for implementing a behavior-based safety process and providing site training, observation, and feedback for Contractor personnel employed at the Site.

L. All Contractor personnel and subcontractor personnel shall have the authority to stop work if unsafe conditions occur or prevail. This authority will be established in the Contractor HASP and communicated to all personnel present in the Work area.

M. The Contractor shall be responsible for acquiring certification for Contractor employees through Homeland Security's e-RailSafe training (http://e-railsafe.com/) in order to work on the BNSF railyard.

N. The Contractor shall be responsible for acquiring certification for Contractor employees through BNSF's "Contractor Orientation Training" (http://contractororientation.com/) in order to work on the BNSF Railyard.

O. The Contractor shall be responsible for stability of excavations and embankments caused by the Contractor's Work. The Contractor shall designate one competent person as defined in 29 CFR Part 1926, Subpart P, Excavations, to inspect and document excavation safety conditions daily, and to ensure excavation safety prior to any personnel entering an excavation.

P. The Engineer will provide the Contractor with a copy of the Engineer's HASP as a reference. The Contractor shall be responsible for preparing their own HASP under which their employees shall work. At a minimum, this HASP shall comply with all the requirements specified in the Engineer's HASP.

Q. The Contractor shall provide access to the School for School staff and contractors as required during the duration of the construction. Where School staff and contractors require access to areas of active construction the Contractor shall provide training, escorts, and PPE as required.

1.05 SUBMITTALS

A. The Contractor shall prepare and submit an updated HASP to the Engineer as a part of the Technical Execution Plan. The Contractor shall follow all applicable local, state, and federal Health and Safety standards, Laws and Regulations, and guidelines implemented through, but not limited to, the OSHA, WISHA, NIOSH, ACGIH, and USEPA. Where these are in conflict, the most stringent requirement shall be followed. The following points shall be addressed in the Contractor's HASP:

1. Names of key personnel and alternates, including major Subcontractor personnel, responsible for Health and Safety, including a Contractor Health and Safety Representative and SSHO. The Engineer must approve the SSHO.
2. A Health and Safety risk or Job Safety Analysis (JSA) associated with each portion of the Work (i.e., list potential chemical and physical hazards), including JSAs for all major components of work, such as excavation and backfilling, stockpiling, backfilling, and restoration activities.
3. Hard copies of the certificates of Contractor employees' e-RailSafe training and BNSF's Contractor Orientation Training.
4. Employee and Subcontractor training assignments to ensure compliance with 29 CFR 1910.120.
5. A requirement that the Contractor locate Underground Facilities by using "Safe Dig" procedures prior to the start of the Work.
6. Personal protective equipment (PPE) to be used for each of the site tasks and operations being conducted, as required by the PPE program in 29 CFR 1910.120, 29 CFR Subpart I, and 29 CFR 1926.
7. Protocols for work around and in water including, but not limited to, special PPE and other equipment to work safely around water.
8. Medical surveillance requirements in accordance with the program in 29 CFR 1910.120.
9. Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used by the Contractor, including methods of maintenance and calibration of monitoring and sampling equipment.

10. Corrective actions and upgrading of personnel protection based on monitoring of air, personnel, and environmental sampling, with specific Action Levels identified.
11. Site control measures in accordance with the control program required in 29 CFR 1910.120 and 29 CFR 1926.
12. Decontamination procedures in accordance with 29 CFR 1910.120 and Section 02130 - Decontamination.
13. An emergency response plan meeting federal, state, and local requirements for safe and effective responses to emergencies, including the necessary PPE and other equipment. Explanation of potential emergencies and contingency plan of action, including description of the route to the nearest appropriate hospital, hospital route map, and posting of emergency telephone numbers at the Site.
14. If confined space entry is required, include confined space entry procedures in accordance with 29 CFR 1910.146, and a list of all anticipated confined space entries required by the Contractor in the course of the Work.
15. A spill containment program meeting the requirements of all applicable local, state, and federal Health and Safety standards.
16. A list of Health and Safety and emergency equipment available on the Site.
17. A description of engineering controls used to reduce the hazards of equipment operation and exposure to site hazardous chemicals.
18. An air monitoring plan describing the method, type, frequency, locations of air monitoring, laboratories, and type of analysis to be performed at the Work area for the purpose of employee safety.
19. Open trench excavation procedures in accordance with applicable OSHA Regulations.
20. Procedures for earthwork near buried utilities, where hand digging should be performed within 24 inches of known utility lines unless more stringent requirements are specified by Laws or Regulations or the affected utility.
21. Training for emergency response procedures as outlined in the Engineer's HASP.
22. Heat stress program consistent with the references provided in the Engineer's HASP.

B. Contractor's Daily Construction Report, submitted in accordance with Section 01320 - Progress Schedules and Reports, shall include a summary of daily safety issues and a summary of the Contractor's Daily Safety Meeting.

C. The Contractor shall submit monthly safety reports that include:

1. The names of all Contractor and Subcontractor personnel employed at the Site at any time during the month, and the names and duties of key personnel including the Contractor's Project Manager, Project Superintendent, SSHO, and excavation-competent person.
2. A summary of all Health and Safety incidents describing any medical treatment that was provided during the month, the current Work status of any individuals affected, the names of individuals who may have observed the incident, and actions taken by the Contractor to address the unsafe act or unsafe condition.
3. A summary of all Health and Safety near-misses or observations providing an opportunity for shared learning and future hazard avoidance. For any Health or Safety incident or near-miss, list the date, the nature of the incident or near-miss,

and the names of individuals involved. A near-miss form for use in submitting near-misses is attached to this Section.

4. The total number of labor hours worked at the Site during that month.
5. Internal Health and Safety audits performed by the Contractor as part of the Contractor's HASP.

D. Prior to initiating Work, the Contractor shall provide the Engineer with documentation of employee and applicable Subcontractor training and medical certifications required by 29 CFR 1910.120 as described in 3.01A of this Section.

E. The Contractor shall submit documentation of training and experience for the designated excavation-competent person.

F. The Contractor shall submit a Hot Work Permit for any welding, torch cutting, or activities that generate sparks. If the Contractor does not have a permit readily available, they may request a permit from the Engineer. In some instances the Engineer's client may require the use of their specific permit and permitting process.

G. The Contractor shall conduct a JSA for significant activities and submit the documentation to the Engineer for review prior to the start of the activities. The Contractor's JSA shall be submitted on the JSA forms attached to this Section, or other forms acceptable to the Engineer.

H. The Contractor shall submit copies of all periodic equipment inspections completed.

1.06 NOTIFICATIONS

A. The Contractor shall immediately (within 30 minutes) verbally report to the Engineer the occurrence of any and all Near Misses and/or Health and Safety incidents. An Incident Report form or Near-Miss Report form, as appropriate, which may be requested from the Engineer, shall be submitted within 24 hours of occurrence of the incident or issue.

B. The Contractor shall immediately and fully investigate any such incident or near-miss and conduct a root cause analysis, and shall submit to the Engineer the Contractor's written corrective action plan for such incident within one day after the incident occurs in accordance with Specifications Section 01330.

C. The Contractor shall notify the Engineer in writing at least five (5) days prior to bringing any hazardous material, equipment, or process to the site, or using the same on the Site. The Contractor shall provide the Engineer with a Material Safety Data Sheet (MSDS) for all chemicals that the Contractor is planning to bring on to the Site.

D. The Contractor shall immediately notify the Engineer in writing of any hazard that the Contractor discovers or observes on the site and corrective measures planned or taken to eliminate or minimize such hazard. Hazard reporting will be completed as a Near-Miss Report as described in 1.05C.3 of this Section.

PART 2 – PRODUCTS

2.01 EQUIPMENT AND FACILITIES

A. The Contractor shall provide all equipment, temporary facilities, and personnel required to perform activities onsite safely in accordance with all Laws and Regulations and standards, and with the Contractor's HASP.

2.02 PERSONAL PROTECTIVE EQUIPMENT

A. The appropriate level of PPE shall be determined by the Contractor for specific tasks as described in the Contractor's HASP. If hazards are identified that require a level of protection greater than Level D (defined in paragraph D below), Work shall be suspended and the Engineer notified. The Contractor's SSHO, in consultation with the Engineer, shall determine what actions are required prior to restarting Work. The Contractor shall determine and document the appropriateness of suggested minimum PPE requirements for the Contractor's employees and others at the Site.

B. The Contractor shall furnish and maintain materials and equipment for the Health and Safety of the Contractor's employees, its Subcontractors, Suppliers, and visitor personnel. The Contractor shall provide all required Health and Safety equipment, first aid equipment, tools, monitoring equipment, PPE, and ancillary equipment and methods required to ensure workers' Health and Safety and to comply with the Contractor's HASP. The Engineer will furnish PPE and monitoring for the Engineer's employees and the Owner's employees.

C. Work under this contract will take place in open excavations with water levels potentially deep enough to present a hazard to all on-site personnel. Special PPE and precautions are required to maintain a safe work area and to provide a safe work environment for Project workers. Specific measures shall be addressed in the Contractor's HASP.

D. Level D protection will be required at all times while onsite by all personnel and visitors on the site, except in Support Zone areas. Level D PPE consists of:

1. Hard hat
2. Steel-toed boots
3. Safety glasses with permanent side shields
4. Work clothes (long pants, shirts with sleeves)
5. Work gloves
6. High visibility orange reflective safety vests
7. Hearing protection (as needed to prevent exposure exceeding 85 dB level)

Additionally, all Contractor and Subcontractor employees must have their company name clearly displayed on their hard hat, safety vest, or shirt.

E. If additional protection consisting of Level C PPE is required during the Work, Level C PPE shall include protection from dust particulates and entrained heavy metals and consist of Level D protection with the following additions:

1. Air purifying respirator, half-face or full-face (depending on required protection factor) with High Efficiency Particulate Air cartridges meeting NIOSH/Mine Safety and Health Administration Specifications; the presence of chemical vapors during activities such as painting could trigger the need for additional respiratory protection
2. Disposable poly-coated chemically protective coveralls
3. Disposable chemically resistant outer gloves (nitrile)
4. Disposable chemically resistant inner gloves (nitrile)
5. Chemically resistant, steel-toed, and steel-shanked boots (PVC, neoprene, or nitrile), or outer booties

F. In most cases, Level C will be the maximum allowed level of PPE. Level B may be allowed provided that personnel are properly trained and certified and exposure levels are below immediately dangerous to life and health (IDLH) conditions.

G. In cases where the Engineer's client requires additional PPE, the Engineer shall notify the Contractor of these additional requirements in advance of mobilization so that the Contractor may obtain the necessary equipment.

2.03 OTHER HEALTH AND SAFETY EQUIPMENT

A. The Contractor is required to have the following equipment available on the Site for the Health and Safety of Contractor, Subcontractors, Suppliers, and visitors:

1. First aid kits
2. Fire suppression equipment (appropriate to location and type of flammable materials present). Equipment will be certified ready for use within the previous twelve months and will also have been inspected each month; documentation supporting certification and inspections will be available for review.
3. Emergency eyewash facilities meeting OSHA/WISHA specifications
4. Personnel decontamination facilities and equipment
5. Other equipment or supplies as determined to be necessary or prudent by the Contractor or the Engineer
6. Flammable liquids storage cabinet(s), if necessary
7. Fall protection equipment appropriate for the hazards on the project
8. Heavy blankets
9. Spill kits

PART 3 – EXECUTION

3.01 WORKER QUALIFICATION

A. The Contractor shall provide the following training to workers except those who will be restricted to the Support Zone:

1. Initial 40-hour OSHA hazardous waste Health and Safety training and current annual 8-hour refresher training
2. Eight-hour OSHA hazardous waste supervisory training (required for the Contractor's Superintendent and SSHO)
3. Dependent upon the project, 10-hour OSHA Construction training

4. Enrollment in a medical monitoring program, with clearance within the previous 12 months from a licensed physician allowing the worker to participate in field activities and use respiratory protective equipment. The Contractor shall not submit detailed medical information for employees.
5. Current respiratory fit testing certification
6. Current cardiopulmonary resuscitation (CPR) and first aid certification for at least two workers assigned to Work on the Site
7. Confined Space Entry Training for workers entering confined spaces
8. For one who is assigned the role of a "competent person," documentation of sufficient and relevant training and experience to perform the assigned duties and responsibilities of that role. As defined in 29 CFR 1926.31, the competent person shall be "one who is capable of identifying existing and predictable hazards, and who has authority to take prompt corrective measures to eliminate them." Relevant training and experience shall be in the same type of Project activities included in the Work under this Contract.
9. Copies of current Contractor Orientation Cards (http://contractororientation.com) and e-RailSafe identification cards (http://e-railsafe.com) in order to work on BNSF property and this worksite.

B. The Contractor shall designate one "competent person" as defined in 29 CFR Part 1926, Subpart P, Excavations, to inspect and document excavation safety conditions daily, and to ensure excavation safety prior to any personnel entering an excavation.

3.02 WORK PLANNING AND MEETINGS

A. The Contractor shall conduct a daily Health and Safety meeting, prior to beginning Work for that day, to address Health and Safety issues, changing site conditions, activities and personnel. All Contractor and Subcontractor employees working on the Site on that day shall attend the meeting. All meetings shall be documented and attendees shall sign acknowledgement of their presence at the meeting. Daily meetings shall include an evaluation of the Work to be conducted, the hazards associated with the work, and control measures being used to reduce exposure.

B. Contractor and Sub-Contractor personnel who are not in attendance for the daily Health and Safety meeting shall be briefed on the meeting notes upon arrival at the Site and prior to commencing their Work activities. All employees shall sign acknowledgement of briefings prior to commencing Work.

C. The Contractor shall hold and document additional safety meetings at the start of each major task and whenever site conditions affecting personnel safety change. Any major task undertaken shall require the completion, or modification, of a JSA as described in this Section.

3.03 ENGINEERING CONTROLS

A. The Contractor shall, at a minimum, provide the following engineering controls to reduce the hazards of equipment operation and exposure to site hazardous chemicals:

1. Roll-over cages for bulldozers, backhoes, loaders, and tractors
2. Back-up alarms for all trucks and moving equipment

3. Wetting of soil and other media or other means to control dust during the Work
4. Temporary fencing
5. Decontamination of personnel and equipment in accordance with Section 02130 - Decontamination
6. Barricades for open trenches and excavations
7. Sloping, benching, shoring, drainage systems, or other controls as necessary to ensure stability of excavations and embankments
8. Others as determined to be necessary or prudent by the Contractor or as directed by the Engineer

B. The Contractor shall post ground-level warning signs every 50 feet below all overhead utilities onsite.

3.04 MONITORING

A. The Contractor shall perform heat exposure and cold exposure monitoring activities as required by weather conditions.

B. The Contractor shall perform all air monitoring activities described in the Contractor's HASP required to provide Health and Safety protection to the Contractor's and Subcontractors' personnel.

C. The Air Monitoring Plan, including personal air monitoring for the Engineers' and Owners' employees and perimeter air monitoring, shall be implemented by the Engineer.

3.05 EVALUATION OF PERFORMANCE

A. The Contractor shall routinely conduct internal safety audits on Subcontract and Sub-subcontract Work sites in accordance with the Contractor's HASP. The focus of these routine audits will be on compliance with OSHA and local occupational safety regulations.

B. The Contractor shall conduct routine behavioral observations and provide immediate feedback during Work activities to promote safe behavior of Contractor employees and Subcontractor employees.

END OF SECTION

1.1 HEALTH AND SAFETY FORMS FOLLOW

Job Safety Analysis

JSA Type: ☐ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☐ Revised	**Date**:
Work Activity:		
Personal Protective Equipment (PPE):		

Development Team	Position/Title	Reviewed By	Position/Title	Date

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Control Measures[3]	STOP Stop Work Criteria
		•	•
		•	•
		•	•
		•	•

1 – Target number of job steps: six to ten

2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Control Measures: Elimination, Engineering Controls, Safe Work Practice/SOP, Administrative Controls, and PPEForm

BNSF – Skykomish School HWF Remediation

SECTION 01250

CONTRACT MODIFICATION PROCEDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submittals
B. Procedures for Changes in the Work
C. Work Change Directive
D. Contractor Request for Change in Contract Price or Contract Time
E. Liquidated Damages
F. Correlation of Contractor Submittals
G. Work Change Directive Form

1.02 SUBMITTALS

A. The Contractor shall submit all documentation and correspondence regarding changes in the Work in accordance with the procedures specified in Section 01330 – Submittal Procedure.

1.03 PROCEDURE FOR CHANGE IN THE WORK

A. The Engineer reserves the right to make, at any time during the work, such changes in quantities and such alterations in the work as are necessary to satisfactorily complete the Project or as directed by the Owner. Such changes in quantities and alterations shall not invalidate the contract nor release the surety, and the Contractor agrees to perform the work as altered. Among others, these changes and alterations may include:

1. Deleting any part of the work
2. Increasing or decreasing quantities
3. Altering specifications, designs, or both
4. Altering the way the work is to be done
5. Adding new work
6. Altering facilities, equipment, materials, services, or sites, provided by the Owner;
7. Directing the Contractor to speed up or delay the work

The Engineer will issue a change order for any change unless other sections of this Contract provide otherwise.

B. Field Order: The Engineer may make minor modifications to the work and provide interpretations or clarifications that do not entail any change to the Contract Price or schedule through the issuance of a Field Order. A Field Order will include the date, name of person issuing it, the relevant Specification or Plan Sheet, and any additional information necessary for proper documentation.

C. Work Change Directive (the form attached to this Section 01250): The Engineer may order an addition, deletion, or revision to the work, or respond to differing or unforeseen physical conditions under which the work is to be performed, such as by adding or modifying quantities under established unit price Bid Items, by issuance of a Work Change Directive. The Work Change Directive shall be signed by the Engineer's project manager or Resident Project Representative, and by the Contractor. The Work Change Directive shall include a

description of the change to the work, including reference to the Specification section(s) and Plan sheet, the method for measurement of the work covered by the unit price, and an estimate of the expected resulting change to the Contract Price and Contract schedule.

D. Change Order (the form attached to this Section 01250): A Change Order will be executed for any Force Account Work to authorize any necessary change to the work that the Contractor shall perform on the basis of a unit price or lump sum price for a new work item that is not included on the bid form Schedule A. The Schedule of Values shall be modified by issuance of a Change Order. The Change Order shall be signed by the Engineer's project manager and signed by the Contractor, and will include a description and justification for the change to the Contract work, including reference to the appropriate specification and plan sheet, the negotiated, new unit price, the method of measurement, and an adjustment as warranted to the Contract schedule.

E. If a change in the Contract work involves a deduction from the Work Order amount, not determinable by reference to the Schedule of Values, the Engineer's estimate shall be accepted by Contractor should the Contractor fail to submit an estimate within five (5) working days following notice of such proposed change. The amount of such deduction shall, at the Engineer's option and fair negotiation, be agreed upon by the Engineer and Contractor for the actual cost saved on labor, material, and equipment usage, which would have been necessary for that portion of the work not performed.

F. The amount allowed the Contractor in excess of the Work Order amount for the performance of additional work, unless being accomplished on a Force Account basis or determined upon reference to an applicable unit price shall be fairly negotiated by the two parties.

G. In the event the Contractor performs any work on a Force Account basis, or cost plus a percentage basis, Contractor shall submit sufficient supporting documentation prior to the application for payment.

H. The Contractor agrees that if the Engineer is not satisfied with the price quoted by Contractor, for any change in the work with a value estimated by the Engineer to be more than $25,000, the Engineer reserves the right to engage another contractor to perform the change in the Work.

I. If the Engineer and Contractor are not able to agree on the amount of money or time, to be added or deducted for any change in the Plans, Specifications or requirements for the work or any Work Order, it shall, nevertheless, be the duty of the Contractor, upon written notice from the Engineer, to proceed immediately with the changes and continue the work as directed by the Engineer.

J. Mark-up for overhead and profit shall be limited to 10%.

1.04 CONTRACTOR REQUEST FOR CHANGE IN CONTRACT PRICE OR CONTRACT TIME

A. The Contractor shall maintain detailed records of work done on the basis of Force Account. The Contractor shall include with the Daily Construction Report itemizing Force Account work for verification and approval by the Engineer each day that Contractor performs work on the basis of Force Account. Included shall be personnel and position, equipment data, materials with invoices, an accurate and concise description of the work performed, location, and time on the task. In order to justify compensation, the extra work must have prior approval from the Engineer. The Force Account work sheets shall be reviewed and signed by both the Contractor superintendent and the Engineer's construction manager, as appropriate, at the end of each day of that work.

B. The Contractor shall document each request for a change in cost or time with sufficient data to allow the Engineer's evaluation of the request. When requested by the Engineer, the Contractor shall provide the following types of additional data for the computation of contract work items and, time and materials, and proposed work:

1. Quantities of products, labor, and equipment
2. Taxes
3. Overhead and profit
4. Justification for any change in contract time

C. The Contractor shall support each claim for additional cost within 15 calendar days of the claimed event with the following information for verification by the Engineer:

1. Origin and date of claim
2. Accurate and concise description of the extra work claimed
3. Dates and times work was performed as well as by whom
4. Time records for labor and equipment solely applicable to the extra work claimed
5. Invoices and receipts for products, equipment, and materials

D. The Contractor shall not perform additional work without the prior written consent of the Owner or the Engineer. Work done without the prior approval of the Owner or the Engineer will not be compensated. Additional work claims shall be identified in writing by the Contractor and submitted to the Engineer for approval a minimum of five working days prior to the commencement of the performance of the additional work.

1.05 LIQUIDATED DAMAGES

A. BNSF and the Contractor mutually acknowledge and agree that a tiered system of liquidated damages based upon fixed Milestone Deadlines is essential to accommodate and balance the potential risk, cost, and liability to BNSF.

B. The Contractor shall comply with the Construction Milestones listed in Schedule A.

C. BNSF, the Contractor, and its Surety agree that the following per diem amounts for liquidated damages based on the construction milestones listed in Schedule A will be assessed for Inexcusable Delays for any reason whatsoever in the amounts shown in the table:

BNSF – Skykomish School HWF Remediation

1	Milestone 1	$500 per day
1a	Milestone 1a	$500 per day
2	Milestone 2	$5,000 per day
3	Milestone 3	$10,000 per day
4	Milestone 4	$500 per day
5	Milestone 5	$500 per day
6	Milestone 6	$1,000 per day
7	Milestone 7	$5,000 per day
8	Milestone 8	N.A.
9	Milestone 9	$200 per day
	Milestones 7 through 8 shall be repeated for each year of treatment.	
16	Milestone 16	$500 per day

D. In view of the impracticality and extreme difficulty of determining the actual amount of such damage for delay in achieving the Milestones set forth above, it is hereby agreed between BNSF and the Contractor that the per diem damages set forth above are fixed and determined by the Parties as the estimated damages that BNSF will suffer by reason of such delay and not by way of penalty.

E. It is further mutually understood and agreed between BNSF and Contractor that the sums of liquidated damages set forth above are additive for each and every day of delay in the event that the Milestones are exceeded. It is further understood and agreed upon by and between BNSF and Contractor that liquidated damages may be assessed against progress payments or retainage and that BNSF will issue a deductive Change Order for the amounts specified herein and will reduce the Contract Price accordingly.

F. In the event the remaining unpaid Contract Price is insufficient to cover the full amount of assessed liquidated damages, Contractor shall pay the difference to BNSF on demand. This paragraph shall not limit BNSF's ability to seek and obtain additional legal remedies or damages that result from breaches of the Contract Documents by Contractor other than those caused by delay in achieving Liquidated Damages.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 CORRELATION OF CONTRACTOR SUBMITTALS

A. The Contractor shall promptly revise the Schedule, Schedule of Values, and Application for Payment forms to record each authorized Work Change Directive or Change Order as a separate line item and adjust the Contract Price prior to the next Request for Payment.

B. The Contractor shall promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit to the Engineer at the next weekly Project Meeting.

C. Contractor shall promptly enter changes onto the Record Drawings.

END OF SECTION 01250

Work Change Directive Form Follows

BNSF – Skykomish School HWF Remediation

Change Order Form

DATE OF ISSUANCE:_____ EFFECTIVE DATE:_____

OWNER: The BNSF Railway Company
DESIGN/BUILDER: Farallon Consulting, L.L.C.
CONTRACTOR: _____
Contract / Work Order:_____
Name of Project:_____ Farallon Project No._____

The Contractor is directed to proceed with the following change to the Project work:

Description:

Purpose for Work Change Directive:

Attachments:

If Engineer or the Contractor believe the above change has affected Contract Price, any Claim for a Change Order based thereon will involve one or more of the following methods as defined in the Construction Sub agreement Documents:

___ Unit Prices

___ Lump Sum $_____

___ Cost of the Work

Estimated increase/decrease in Contract Price: $_____. Should this change involve a budget increase, the estimated amount shall not be exceeded without prior authorization.	Estimated increase/decrease in Contract Time: Substantial Completion:_____ days; Ready for final payment: _____ days.

BNSF – Skykomish School HWF Remediation

SECTION 01275

MEASUREMENT AND PAYMENT

PART 1–GENERAL

1.01 THIS SECTION INCLUDES

- Quantity Estimates
- Payment
- Measurement of Quantities
- Assessment of Non-Conforming Work
- Eliminated Items
- Application for Payment
- Measurement and Payment of Contract Unit Bid Items

1.02 QUANTITY ESTIMATES

A. For all Unit Bid Price Work, the Contract Price shall include an amount equal to the sum of the unit price for each pay item times the estimated quantity of each item as indicated in the Bid Form. The estimated quantities shown on bid form Schedule A are not guaranteed and are solely for the purpose of comparison of bids and determining an initial Contract Price. Quantities and measurements supplied or placed in the Work in accordance with the Specifications and Plans verified by the Engineer will determine payment.

B. The Engineer will determine the actual quantities and classifications of Unit Price Work performed by the Contractor. The Engineer will review with the Contractor the Engineer's preliminary determinations before rendering a written decision on an Application for Payment.

C. If the actual Work requires more or fewer units than the estimated units indicated on Bid Form Schedule A, the Contractor shall provide the required units at the unit prices contracted. Under no circumstances may the Contractor exceed stated quantities without prior written approval from the Engineer. The unit price submitted by the Contractor will not be renegotiated due to changes in the number of units.

D. The Contractor may choose to bid Part A or Part B, or both Part A and Part B of Schedule A. BNSF reserves the right to award both parts of one contractor or award each part to separate contractors.

E. Contractors choosing to bid Part B alone, or be considered for award of Part B alone, shall include all costs for Part A work coordination, inspection, and acceptance in the Part B costs for Part B, Bid Item 3. Equipment Installation and Testing (Fall 2015).

1.03 PAYMENT

A. Payment includes: Full compensation for all required labor; products; tools; equipment; plant; transportation; services; and incidentals; erection, application, or installation of an item of the Work, including overhead and profit. The above plus transportation, insurance and bonding, overhead, and profit.

B. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable to the Engineer;
2. Products determined as unacceptable before or after placement;
3. Products not completely unloaded from the transporting vehicle;
4. Products placed outside the Project limits;
5. Loading, hauling, and disposing of rejected materials;
6. Products remaining on-hand after completion of work;
7. Additional work undertaken solely to expedite Contractor operations;
8. Repair or replacement of monitoring wells (beyond that described in these Plans and Specifications), utilities, or any other facility property located within or adjacent to the work Area (including the soil stockpiling area excavation).

C. Payment will be reviewed for approval by the Engineer for all work related to and actually performed under this Contract during a particular payment period. Retainage will be held from each Part A – HWF Facilities Installation invoice at the rate of 10%. No retainage will be withheld for work performed under Part B – HWF Treatment Equipment and Operation. Payment for lump sum items will be made based on percent completion of the pay item. Upon approval of the Engineer, judgments of the percent complete of lump sum items will be made in reference to the Schedule of Values.

1.04 MEASUREMENT OF QUANTITIES

A. Measurement of Weight:

1. Weigh Scales: Scales shall be provided by the Contractor and certified in accordance with applicable Laws and Regulations for the State of Washington. Certification shall be made within a period of not more than one year to date of use for weighing commodity. Contractor shall submit copy of certificate.
2. The term "ton" will mean the short ton consisting of 2,000 pounds.
3. For shipments to off-site waste management facilities and locations, trucks shall be weighed at the receiving facility for the purpose of measuring the quantity of Unit Bid Item for payment.

B. Measurement by Volume:

1. Materials that are to be measured by the cubic yard, vehicular measure, shall be hauled in vehicles approved by the Engineer and measured at the point of delivery. Vehicles for this purpose may be of any size or standard type and found acceptable by the Engineer, provided the body is of such shape that its capacity and actual contents can be readily and accurately determined. Each load shall be leveled upon its arrival at the point of delivery, if so directed by the Engineer. Deductions will be made in half cubic yard increments on loads that contain less than the vehicle capacity. Each hauling vehicle shall bear a legible identification mark conspicuously located for identification.
2. Volumes that are to be measured as in-place volumes will be determined by survey or other method proposed by Contractor and approved by the Engineer. If surveyed, the

Contractor shall retain the services of an independent land surveyor, licensed and registered in the State of Washington, whose determination of in-place volumes shall be authoritative and final for the purpose of measurement and payment. To compute in-place volumes of excavation, the average area end method or other methods acceptable to the Engineer shall be used.

3. Measurement of Oil: Measured by U.S. gallon using a flow meter or other method of documentation.

C. Measurement by Area: Measured by square dimension using length and width or radius.

D. Linear Measurement: Measured by linear dimension at the item centerline or mean chord.

1.05 ASSESSMENT OF NON-CONFORMING WORK

A. The Contractor shall replace work, or portions of the work, that do not conform to the tolerance limits of the Plans and Specifications as determined by the Engineer.

B. Should the Engineer determine that it is not practical to remove and replace the non-conforming item; the Engineer will direct one of the following remedies:

1. The non-conforming item may remain; however, the unit price will be adjusted downward to a new price negotiated by the Engineer and the Contractor.
2. The non-conforming bid item shall be corrected to within acceptable tolerance limits of the Plans and Specifications and the unit price will be adjusted to a new, downwardly negotiated unit bid price by the Engineer and the Contractor.

C. The individual Specification sections may modify these options or may identify a specific formula or percentage price reduction.

D. The Engineer's authority to review and assess work not sufficiently conforming to the Plans and Specifications and to assign corrective measures is final.

1.06 ELIMINATED ITEMS

A. The Contractor may be awarded Part A or Part B, or both Part A and Part B of the contract.

B. Should any items or component of a contract unit bid item contained in the Plans and Specifications be found unnecessary for the completion of the work, the Engineer shall provide written direction eliminating this work from the Contract. This action shall in no way invalidate the Contract Agreement.

C. Contractor shall be paid for actual Work done and all documented costs incurred, including mobilization of materials prior to elimination of such items.

1.07 APPLICATION FOR PAYMENT

A. The Contractor shall submit application for progress payment as specified in Section 01290 – Payment Procedures.

1.08 MEASUREMENT AND PAYMENT OF BID ITEMS

BNSF – Skykomish School HWF Remediation

A. Bid Form Schedule A, Schedule of Quantities and Prices, lists the Bid Items and Price Items for the Work. Measurement and payment of the Work covered by the Contract Documents is specified herein below. The Contractor's overhead and profit in each line item in the Bid Form shall be included in each corresponding unit cost.

B. At the direction of the Engineer, Contractor may ask to perform change order work on a time and materials basis. Schedule E – List of Equipment, and Schedule G – List of Personnel, shall be the basis for measurement and payment of equipment and labor for Time and Materials Work. Hourly prices for equipment and labor listed on Schedule E and Schedule G shall include Contractor's overhead and profit for such Time and Materials Work.

C. The contract is divided into Part A and Part B. Part A of the contract is for construction of the HWF treatment system infrastructure, including:

1. Sheet pile installation
2. Well and well head installation
3. Subsurface piping and conduit installation
4. Vault installation
5. Treatment area and equipment pad preparation
6. Cap installation
7. Utility restoration
8. Site restoration

Part B of the contract is for construction and operation of the HWF treatment system equipment, including:

1. Electrical controls and instrumentation installation
2. Pump installation
3. Skimmer installation
4. SVE system equipment installation
5. HWF system equipment installation
6. Equipment startup
7. System operations
8. Equipment decommissioning and demobilization

D. The following paragraphs specify measurement and payment of the Bid Items listed on Bid Form Schedule A. The descriptions provided are intended to be general in nature and to encompass the entire Work. Where specification sections are referenced, they are intended to aid in describing the intended work items to be included in the bid item. They are not intended to limit bid item contents. The bidder will also review drawings for all information pertaining to each individual bid item. The bidder is required to include costs in each bid item that relate to the related task, whether specifically stated in the referenced section or not.

BNSF – Skykomish School HWF Remediation

PART A – HWF FACILITIES INSTALLATION

Bid Item 1. Mobilization, Demobilization, and Site Preparation

a. Work required to complete Mobilization, Demobilization, and Site Preparation includes, but is not limited to:

   i. Movement of personnel, equipment, and materials to the Site, only if such movement is not included in any other Bid Item.

   ii. Preparation, submittal, and revision of all required submittals as described in Specification 01330 – Submittal Procedures for the Work.

   iii. Removal of all personnel, equipment, and materials from the Site at the completion of the Work.

   iv. Construct temporary access roads as necessary.

   v. Temporary utility relocation and maintenance.

   vi. Perform fuel tank and fuel line tightness testing.

   vii. Not included in this bid item is shipment and setup of HWF treatment equipment.

b. Mobilization, Demobilization, and Site Preparation will be measured for payment as one unit, complete as specified.

c. Payment for Mobilization, Demobilization, and Site Preparation Work will be made on a percent complete basis of the lump sum price for the Bid item listed on Bid Form Schedule A. Payment of the lump sum price for "Mobilization, Demobilization, and Site Preparation" shall constitute full compensation for all labor, supervision, materials, equipment, pre-mobilization submittals, pre construction meetings, incidentals and all other costs necessary to complete Mobilization, Demobilization, and Site Preparation Work, including the transport of all equipment, labor and temporary facilities and materials to and from the Site. No more than 75% of this bid item shall be invoiced after mobilization is complete with the balance invoiced after demobilization from the site.

Bid Item 2. Temporary Construction Facilities and Controls, and Erosion Control

a. Work required to complete the Temporary Facilities and Controls includes, but is not limited to:

   i. Implement requirements for environmental protection specified in Specification 01140 – Work Restrictions unless specifically identified as being provided by others.

   ii. Implement health and safety requirements specified in Specification 01150 – Health and Safety Requirements.

   iii. Provide and maintain temporary facilities and controls as shown on Plans and specified in Specification 01500 – Temporary Facilities and Controls unless specifically identified as being provided by others.

iv. Maintain temporary erosion and sediment controls as shown on Plans and specified in Specification 01575– Temporary Erosion and Sediment Controls unless specifically identified as being provided by others.

v. Maintain decontamination facilities as shown on Plans and specified in Specification 02130 – Decontamination.

vi. Provide and maintain protection for those wells, storm drain inlets, and catch basins to remain as identified in the Plans.

vii. Provide all equipment, materials, and labor required to provide for recovery, management, and disposal of oil in the excavation area as specified in Specification 02250 – Oil Recovery in Excavation Area.

viii. Provide, maintain, and repair of all temporary facilities, utilities, and controls including those provided by others during the period when Work is taking place at the Site.

ix. Installation and maintenance of all temporary facilities associated with material stockpiling and loading as specified in Specification 02110 – Excavation and Stockpiling.

x. Installation and maintenance of all temporary facilities required for protection of interior and exterior school building structures from damage during construction.

xi. Installation, maintenance, and operation of all geotechnical monitoring facilities as shown on the Plans and as described in the Specifications Section 02150 – Geotechnical Instrumentation and Monitoring.

b. Temporary Construction Facilities and Controls, Erosion Control, Oil Recovery, and Dewatering Work will be measured for payment as a lump sum.

c. Payment for Temporary Construction Facilities and Controls, Erosion Control, Oil Recovery, and Dewatering Work will be made on the lump sum price for the Bid Item in Schedule A. Payment shall be made as a percentage of the bid item complete completed within the progress period. Payment for "Temporary Construction Facilities and Controls, Erosion Control, Oil Recovery, and Dewatering" shall constitute full compensation for all labor, supervision, materials, equipment, incidentals and all other costs necessary to complete Temporary Construction Facilities and Controls, Erosion Control, Oil Recovery, and Dewatering Work as shown on the Plans and in these specifications.

Bid Item 3. Select Demolition – Exterior

a. Work required to complete Select Demolition – Exterior includes but is not limited to

i. Utility locates required prior to demolition

ii. Site clearing, grubbing, salvage, disposal or storage of vegetation for restoration.

iii. Demolition and removal of exterior structures as shown on the Plans and as specified in Specification 02220 – Demolition, unless specifically included in another pay item.

iv. Removal, transport, and disposal of existing asphalt paving and concrete, and preservation of paving and walkways to remain as shown on Plans.

v. Preservation of existing utilities, septic tanks, and fuel oil facilities.

vi. Removal and disposal or storage of portions of the irrigation system and septic system piping as required for construction and shown on the Plans.

vii. Preservation and protection of the School building, associated structures, and the teacherage.

viii. Preservation and protection of existing monitoring wells in the area of construction.

ix. Removal of existing decorative planter and salvage of historic items to Owner.

x. Removal of existing chain link fence as required for construction.

xi. Removal and disposal of existing play structure and play area.

b. Payment for this bid item will be made in accordance with the lump sum price for the Bid Item "Select Demolition - Exterior" listed on Bid Form Schedule A. Payment shall be made as a percentage of the bid item completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary to complete the select demolition as shown on the Plans and as specified in Section 02220-Demolition.

Bid Item 4. Select Demolition - Interior

a. Work required to complete demolition of building interior structures as required for treatment system construction includes, but is not limited to:

i. Utility locates required prior to excavation.

ii. Partitioning off interior areas where access is not required for construction.

iii. Protection of interior structures.

iv. Moving and protection of furniture and accessories.

v. Abatement of areas of select demolition.

vi. Saw cutting, removal, transport, and disposal of concrete and other building materials.

vii. Foundation wall penetrations.

viii. Building partition removal.

ix. Removal and protection of door assemblies for re-installation.

x. Perform select interior demolition in accordance with Section 02220 – Demolition.

b. Payment for this bid item will be made in accordance with the lump sum price for the Bid Item "Select Demolition - Interior" listed on Bid Form Schedule A. Payment shall be made as a percentage of the bid item completed within the

progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary to complete the select interior demolition as shown on the Plans and as specified in Section 02220-Demolition.

Bid Item 5. Select Demolition – Unknown Subsurface Structures

a. Work required to complete of demolition of unknown subsurface structures as required for treatment system construction includes, but is not limited to:

   i. Breakup and removal of subsurface structures other than associated with known building walls, slabs, foundation walls, and footings.

   ii. Removal, transport, and disposal of concrete and other building materials as required.

   iii. This Excavation Work does not include excavation required to construct or install any temporary facility or controls covered by another pay item.

   iv. Perform select interior demolition in accordance with Section 02220 – Demolition.

b. Payment for this bid item will be made in accordance with the procedures for issuing a Work Change Directive as described in Section 01250 Contract Modification Procedures. Each Work Change Directive will reduce the allowance amount shown in Schedule A (Bid Item 5.) accordingly. The Allowance will be increased by the Owner should all final negotiations and value of all Work Change Directives exceed the allowance amount. Should the total Work Change Directives be less than the allowance, a deductive change order will be issued to the Contractor for the unused portion at completion and acceptance of the work.

c. Payment for this bid item shall be made as a percentage completed of the Engineer accepted Work Change Directives within the progress period. Payment for Work Change Directives completed for "Select Demolition – Unknown Subsurface Structures" shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, investigations, demolition, material disposal, and all other costs necessary to complete the work.

Bid Item 6. Excavation, Transportation, Stockpile of Clean Overburden

a. Work required to complete Excavation, Transportation, Stockpile of Clean Overburden from excavation areas includes, but is not limited to:

   i. Excavate soil and other material from the limits and grades and designated as clean overburden as shown on the Plans and as specified in Specification 02110 – Excavation and Stockpiling, unless specifically included in another pay item

   ii. Any on-site transportation, stockpile, and handling of the excavated clean overburden material.

   iii. Excavation of utility trenches as shown on the Plans

   iv. This Excavation Work does not include excavation required to construct or install any temporary facility or controls covered by another pay item.

b. Excavation, Transportation, and Stockpile of Clean Overburden will be measured for payment by the excavated cubic yard measured by field survey of Clean Overburden excavation areas or other method approved by the Engineer.

c. Payment for this bid item will be made in accordance with the unit price for the Bid Item "Excavation, Transportation, and Stockpile of Clean Overburden" listed on Bid Form Schedule A. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary to complete the excavation, handling, local transportation and stockpiling work of clean overburden material as shown on the Plans and as specified in Section 02110-Excavation and Stockpiling.

Bid Item 7. Excavation, Loading, and Transportation of Impacted Material

a. Work required to complete Excavation, Loading, and Transportation of Impacted Material includes, but is not limited to:

   i. Excavate TPH impacted soil and other material from the limits and grades as shown on the Plans, as directed by the Engineer, and as specified in Specification 02110 – Excavation and Stockpiling and 02120 – Transportation of Construction Debris, Impacted Decontamination Water, and Non-Hazardous Materials.

   ii. Loading and transport of impacted material to the landfill designated by BNSF.

b. Excavation, Loading, and Transportation of Impacted Material will be measured by the ton as determined by stamped, weighted load tickets from a certified scale and scalemaster as provide by the disposal facility.

c. Payment for this bid item will be made in accordance with the unit price for the Bid Item "Excavation, Loading, and Transportation of Impacted Material" listed on Bid Form Schedule A. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary to complete the excavation, handling, transportation and documentation associated with excavation, loading, and transport of impacted material as shown on the Plans and as specified in Section 02110-Excavation and Stockpiling and 02120 – Transportation of Construction Debris, Impacted Decontamination Water, and Non-Hazardous Materials.

Bid Item 8. Oil/Water Recovery and Disposal

a. Work required to complete Oil/Water Recovery and Disposal includes, but is not limited to:

   i. Containment and recovery of oil in the excavation areas during both excavation and backfilling activities;

   ii. All labor, equipment, materials, hoses, fitting, and incidentals needed to control and recover oil as specified in Section 02250-Oil Recovery.

b. Oil Disposal will be measured for payment on a per gallon basis as documented by disposal tickets provided by the disposal facility and accepted by the Engineer.

c. Payment for Oil/Water Recovery and Disposal will be made in accordance with the unit price for the Bid item in Schedule A. Payment of the unit price for "Oil/Water Recovery and Disposal" shall constitute full compensation for all labor, supervision, materials, incidentals, maintenance, and all other costs necessary to complete work specified in Section 02250- Oil Recovery. Disposal tickets shall be submitted with the applicable application for payment.

Bid Item 9. Import and Place Structural Fill

a. Work required for the Import and Place Structural Fill pay item includes, but is not limited to:

   i. Provide Structural Fill material from an approved off-site source, in accordance with Specification 02060 – Aggregate Material, to the Site.

   ii. Any on-site staging or stock piling of Structural Fill.

   iii. Transporting Structural Fill from stockpiles to the location where it shall be placed.

   iv. Place, compact, and grade Structural Fill material in accordance with the Plans and as specified in Section 02310- Backfilling and Grading.

b. Import and Place Stockpile Structural Fill work will be measured for payment on a per ton basis as documented by stamped, weighted load tickets from a certified scale and scalemaster.

c. Payment for this bid item will be made in accordance with the unit price for the Bid Item "Import Structural Fill" listed on Bid Form in Schedule A. Payment of the unit price for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary to complete the work as specified in Section 02060 - Aggregate Materials and Section 02310 – Backfilling and Grading.

Bid Item 10. Import and Place Stabilization Aggregate

a. Work required for the Import and Place Stabilization Aggregate pay item includes, but is not limited to:

   i. Provide Stabilization Aggregate material from an approved off-site source, in accordance with Specification 02060 – Aggregate Material, to the Site.

ii. Any on-site staging or stockpiling of Stabilization Aggregate.

iii. Transporting Stabilization Aggregate from stockpiles to the location where it shall be placed

iv. Place, compact, and grade Stabilization Aggregate material in accordance with the Plans and as specified in Section 02310- Backfilling and Grading.

b. Import and Place Stabilization Aggregate work will be measured for payment on a per ton basis as documented by stamped, weighted load tickets from a certified scale and scalemaster.

c. Payment for this bid item will be made in accordance with the unit price for the Bid Item "Import and Place Stabilization Aggregate" listed on Bid Form in Schedule A. Payment of the unit price for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary to complete the work as specified in Section 02060 - Aggregate Materials and Section 02310 – Backfilling and Grading.

Bid Item 11. Import and Place Pea Gravel Backfill

a. Work required for the Import and Place Pea Gravel Backfill pay items includes, but is not limited to:

i. Provide Pea Gravel Backfill material from an approved off-site source, in accordance with Specification 02060 – Aggregate Materials, to the Site.

ii. Any on-site staging or stock piling of this Pea Gravel Backfill material

iii. Transporting Pea Gravel Backfill from stockpiles to the location where it shall be placed

iv. Place, compact, and grade Pea Gravel Backfill material in accordance with the Plans and as specified in Section 02310- Backfilling and Grading.

b. Import and Stockpile Pea Gravel Backfill work will be measured for payment on a per ton basis as documented by stamped, weighted load tickets from a certified scale and scalemaster.

c. Payment for this bid item will be made in accordance with the unit price for the Bid Item "Import Pea Gravel Backfill" listed on Bid Form in Schedule A. Payment of the unit price for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary to complete the work as specified in Section 02060 - Aggregate Materials and Section 02310- Backfilling and Grading.

Bid Item 12. Sheet Pile Installation

a. Work Required for the Sheet Pile Installation pay item includes, but is not limited to:

i. Handling and installation of BNSF supplied sheet pile by direct push/auger drill method required to construct the sheet pile wall.

ii. Sheet pile handling, and sheet pile installation by direct push/auger drill method as specified in Section 02464 – Sheet Piling.

b. Sheet Pile Installation will be measured on the lineal feet of sheet pile installed as measured from the bottom elevation of each sheet to the top of wall elevation as shown on the Plans.

c. Payment for this bid item will be made in accordance with the unit price for the Bid item "Sheet Pile Installation" shall constitute full compensation of all sheet pile handling, labor, supervision, equipment, incidentals, and all other costs necessary to pre-excavate, handle and install sheet pile.

Bid Item 13. Sheet Pile Installation Requiring Pre-Excavation

a. Work Required for the Sheet Pile Installation Requiring Pre-Excavation pay item where approved by the Engineer includes, but is not limited to:

   i. Removal of partially installed sheets, pre-excavation of area to re-install sheets, handling, and installation of BNSF supplied sheet pile by direct push/auger drill method required to install the sheet pile.

   ii. Pre-excavation, sheet pile handling, and sheet pile installation by direct push/auger drill method as specified in Section 02464 – Sheet Piling.

   iii. Excluded from this pay item is work covered under other pay items, including Excavation, Transportation, Stockpiling, and Re-use of Clean Overburden, Excavation Loading, and Transportation of Impacted Material, Oil/Water Recovery and Disposal, Import and Place of Structural Fill, and Import and Place Stabilization Aggregate.

b. Sheet Pile Installation Requiring Pre-Excavation will be measured on the lineal feet of sheet pile installed as measured from the bottom elevation of each sheet to the top of wall elevation as shown on the Plans.

c. Payment for this bid item will be made in accordance with the unit price for the Bid item "Sheet Pile Installation Requiring Pre-Excavation" shall constitute full compensation of all pre-excavation, sheet pile handling, labor, supervision, equipment, incidentals and all other costs necessary to pre-excavate, handle and install sheet pile.

Bid Item 14. Sheet Pile to MSE Wall Grouting

a. Work Required for the Sheet Pile to MSE Wall Grouting pay item includes, but is not limited to:

   i. Material and equipment supply, primary, and secondary hole drilling, grout preparation, and grout injection.

   ii. Sheet Pile to MSE Wall Grouting as shown on the Plans and specified in Section 02280 – Permeation Grouting.

b. Sheet Pile to MSE Wall Grouting will be measured on a lump sum basis.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid item "Sheet Pile to MSE Wall Grouting" listed on Bid Form in Schedule A. Payment shall be made as a percentage of the work completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary to perform Sheet Pile to MSE Wall Grouting.

Bid Item 15. Water Distribution System

a. Work required to complete the Water Distribution System pay item includes, but is not limited to:

   i. Provide and install any trench excavation shoring unless specifically included in another pay item.

   ii. Provide and install Water Distribution piping and fittings as shown on the Plans and in accordance with Specification 02510 – Water Distribution System.

   iii. Connection of a new main to the existing water main as shown on the Plans and in accordance with Specification 02510 – Water Distribution System.

   iv. All other Water Distribution components as shown on the Plans.

b. Water Distribution System Complete will be measured for payment as one unit, completed as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid item "Water Distribution System" listed on Bid Form in Schedule A. Payment shall be made as a percentage of water distribution system complete as completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, including trench excavation shoring, pipe bedding, backfill, compaction, pipe, jointing, restraining, bends, manholes, water quality testing, to construct the water distribution system complete as depicted in these Plans and Specifications.

Bid Item 16. Storm Drainage System

a. Work required to complete the Storm Drainage System pay item includes, but is not limited to:

   i. Provide and install any trench excavation shoring unless specifically included in another pay item.

   ii. Provide and install gravity storm drainage piping and associated fittings as shown on the Plans and in accordance with Specification 02501 – Storm Drainage System.

   iii. Provide and install Concrete Basins, Frames and Covers, Ladders as shown on the Plans and in accordance with Specification 02501 – Storm Drainage System.

   iv. All other Storm Drainage System components as shown on the Plans.

b. Storm Drainage System complete will be measured for payment as one unit, completed as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid Item "Storm Drainage System" listed on Bid Form in Schedule A. Payment shall be made as a percentage of sewer system completed within the

progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, including trench excavation shoring, pipe, and manholes, to construct the storm drain system complete as depicted in these Plans and Specifications.

Bid Item 17. Sanitary Sewer System

a. Work required to complete the Sanitary Sewer System pay item includes, but is not limited to:

   i. Provide and Install the Sanitary Sewer System as shown on the Plans and in accordance with Specification 02535 – Sanitary Sewer System.

   ii. All other Underground Sanitary Sewer System components as shown on the Plans.

   iii. Connect or Tie in Septic Tanks to new sewer main as shown on the Plans.

b. Sanitary Sewer System will be measured for payment as one unit, complete as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid Item "Sanitary Sewer System" listed on Bid Form in Schedule A. Payment shall be made as a percentage of sanitary sewer system completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary including, piping, septic tanks, field testing to construct the Underground Sanitary Sewer complete as depicted as shown on the Plans and Specifications.

Bid Item 18. Asphaltic Concrete Pavement

a. Work required to complete the Asphaltic Concrete Pavement pay item includes, but is not limited to providing and installing Asphaltic concrete pavement per Specifications 02611 – Asphalt Concrete Paving, and as shown on the Plans. The Contractor shall provide and install Asphaltic Concrete Pavement for areas as shown on the Plans.

b. Asphalt Concrete Paving will be measured on per ton basis documented by stamped, weighted load tickets from a certified scale and scalemaster.

c. Payment for this bid item will be made in accordance with the unit price for Bid item "Asphaltic Concrete Pavement" listed on Bid Form in Schedule A. Payment of the unit price for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, haul, compaction, testing, incidentals, and all other costs necessary to complete the work as depicted in these Plans and Specifications.

Bid Item 19. Concrete Sidewalk

a. Work required to complete the Concrete Sidewalk pay item includes, but is not limited to:

   i. Provide and install concrete sidewalks as shown in the Plans in accordance with Specification 02601 – Cement Concrete Sidewalks.

ii. Provide all other Concrete Sidewalk materials as shown the Plans.

b. Concrete Sidewalk work will be measured for payment on a square yard basis as indicated on the Plans.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "Concrete Sidewalk" listed on Bid Form in Schedule A. Payment of the unit price for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, haul, compaction, testing, incidentals, curb ramps, and all other costs necessary to complete the work as depicted in these Plans and Specifications.

Bid Item 20. Treatment Area Cap

a. Work required to complete the construction of the Treatment Area Cap pay item includes, but is not limited to:

i. Excavate, grade, and prepare the site for installation of the Treatment Area Cap as shown in the Plans and Specifications, unless specifically included in another pay item.

ii. Installation of geotextile and geomembrane materials as shown on the plans and specified in Specification Section- 02371 Geotextile and Geomembrane.

b. Treatment Area Cap pay item will be measured for payment as one lump sum, completed as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid Item "Treatment Area Cap" listed on Bid Form in Schedule A. Payment of the lump sum price for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary to complete the work as depicted in these Plans and Specifications and <u>not</u> including excavation and stockpiling of overburden, supply and placement of backfill materials, and work included in other bid items.

Bid Item 21. HWF System Installation – Subsurface

a. Work required to complete the HWF System Installation – Subsurface pay item includes, but is not limited to:

i. Provide and install the subsurface portion of the HWF System as shown on the Plans and in accordance with Specification 11200 – Hot Water Flushing System

ii. Provide and install all piping, conduit, wells, well heads, valves, vaults, and fittings as shown on the Plans and in accordance with Specification Section 02670 – Well Construction, and Section 15200 – Process Piping, Valves, and Instruments.

iii. Provide, place, and compact the subgrade, bedding, and backfill as required for piping installation.

b. HWF System Installation – Subsurface will be measured for payment as one lump sum, completed as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid item "HWF System Installation – Subsurface" listed on Bid Form in Schedule A. Payment shall be made as a percentage of HWF System Installation – Subsurface completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, including trench excavation shoring, pipe, jointing, restraining, bends, manholes, to construct the HWF system complete as depicted in these Plans and Specifications, and not including supply and placement of backfill materials, and work included in other bid items.

Bid Item 22. Restoration – Interior

a. Work required to complete the Restoration – Interior pay item includes all labor and materials necessary to complete the following items:

   i. Provision, placement, and final finish of interior concrete impacted during construction grading in accordance with Specification 03301 – Cast-in-Place Concrete and as depicted in the Plans.

   ii. Removal of all partitions and temporary structures.

   iii. Replacing furniture and accessories to original locations.

   iv. Repair or replacement of any furniture, fittings, or structures damaged during construction.

   v. Provide, replace, and finish other structures and finishes, including doors and door structures, as required to restore the areas impacted by installation of interior piping and wells.

b. Restoration – Interior will be measured for payment as one lump sum, completed as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid Item "Restoration – Interior" listed on Bid Form in Schedule A. Payment shall be made as a percentage of site restoration completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to restore the building site to a pre-construction condition and as depicted in these Plans and Specifications.

Bid Item 23. Restoration – Exterior

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision, placement, and final grading of topsoil within the horizontal limits and elevations in accordance with Specification 02055 – Topsoil and as depicted in the Plans.

   ii. Provide and Application of sod, water, fertilizer, and mulch in accordance with Specification 02055 – Topsoil.

   iii. Provide and install Planting in accordance with Specification 02920 – Sod.

iv. Maintenance of the restored area until the native grass cover is well established.

v. Restoration of site irrigation system. An as-built drawing for the irrigation system is provided as Appendix G to these specifications.

b. Site Restoration will be measured for payment as one lump sum, completed as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid Item "Restoration – Exterior" listed on Bid Form in Schedule A. Payment shall be made as a percentage of site restoration completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to restore the construction site to a pre-construction condition, including incidental items such as topsoil and sod as depicted in these Plans.

Bid Item 24. Play Structure

d. Work required to provide and install a new school play structure includes, but is not limited to:

v. Installation of footings and preparation of subgrade.

vi. Procurement, delivery, and installation of new play structure.

vii. Installation of play structure cushion area.

e. Payment for this bid item will be made in accordance with the procedures for issuing a Work Change Directive as described in Section 01250 Contract Modification Procedures. Each Work Change Directive will reduce the allowance amount shown in Schedule A (Bid Item 24.) accordingly. The Allowance will be increased by the Owner should all final negotiations and value of all Work Change Directives exceed the allowance amount. Should the total Work Change Directives be less than the allowance, a deductive change order will be issued to the Contractor for the unused portion at completion and acceptance of the work.

f. Payment for this bid item shall be made as a percentage completed of the Engineer accepted Work Change Directives within the progress period. Payment for Work Change Directives completed for "Plan Structure" shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, investigations, demolition, material disposal, and all other costs necessary to complete the work.

PART B – HWF TREATMENT EQUIPMENT AND OPERATION

Bid Item 1. HWF System – Equipment Fabrication and Delivery (Fall 2015)

a. Work required to complete the HWF System – Equipment Fabrication and Delivery (Fall 2015) pay item includes, but is not limited to:

i. Provide HWF System Equipment as shown on the Plans and in accordance with Specification 11200 – Hot Water Flushing System as required for winter operations in 2015-2016.

ii. At a minimum the equipment fabricated and delivered in the Fall of 2015 will include the controls enclosure and controls components required for remote monitoring subsurface conditions as described in Specifications - 13803 Process Control.

iii. Perform system startup and testing in accordance with Specifications 01810-Commissioning and 01820-Demonstration and Training.

b. HWF System – Equipment Fabrication and Delivery (Fall 2015) will be measured for payment as one lump sum, completed as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid item "HWF System – Equipment Fabrication and Delivery (Fall 2015)" listed on Bid Form in Schedule A. Payment shall be made as a percentage of HWF System – Equipment Fabrication and Delivery (Fall 2015) completed and accepted for delivery by the Engineer within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, including pipe, valves, fittings, building enclosures, subslab vacuum and interior VOC monitoring equipment, protective structures, process equipment, electrical service, conduit, wiring, controls, startup, and training required for the HWF System – Equipment Fabrication and Delivery (Fall 2015) complete as depicted in these Plans and Specifications.

Bid Item 2. HWF System – Equipment Fabrication and Delivery (Spring 2016)

a. Work required to complete the HWF System – Equipment Fabrication and Delivery (Spring 2016) pay item includes, but is not limited to:

i. Furnish and Install HWF System Equipment as shown on the Plans and in accordance with Specification 11200 – Hot Water Flushing System and required to complete the treatment system for hot water flushing operation.

ii. All other HWF System components as shown on the Plans and in accordance with Specifications 13220-Vapor Phase Carbon, 13803-Process Control, 13900-Oil Skimmer, 15182-Flow Measuring Instruments, 15200-Process Piping, 15518-Hot Water Boiler, 15540-Pumps – Centrifugal and Diaphragm, 15662-Process Chillers, 15710-Air to Air Heat Exchanger, 15715-Air to Water Heat Exchanger, 15830-Blowers, 16050-Basic Electrical, 16060-Power and Standby Power, 16231-Standby Generator.

b. HWF System – Equipment Fabrication and Delivery (Spring 2016) will be measured for payment as one lump sum, completed as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid item "HWF System – Equipment Fabrication and Delivery (Spring 2016)" listed on Bid Form in Schedule A. Payment shall be made as a percentage of HWF System – Equipment Fabrication and Delivery (Spring 2016) completed and accepted for delivery by the Engineer within the progress period. Payment

for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, including pipe, valves, fittings, building enclosures, protective structures, process equipment, electrical service, wiring, controls, startup, and training required for the HWF System – Equipment Fabrication and Delivery (Spring 2016) complete as depicted in these Plans and Specifications.

Bid Item 3. Equipment Installation and Testing (Fall 2015)

a. Work required to complete the Equipment Installation and Testing (Fall 2015) pay item includes all labor and materials necessary to complete the following items:

   i. All work required to coordinate with Part A – HWF Facilities Installation (and Part A – HWF Facilities Installation Contractor as required).

   ii. Installing, connecting, and testing components required for remote monitoring of subsurface conditions.

   iii. All work required to winterize the installed facilities to provide for operation and protect from freezing and adverse weather.

b. Equipment Installation and Testing (Fall 2015) will be measured for payment as one lump sum, completed as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid Item "Equipment Installation and Testing (Fall 2015)" listed on Bid Form in Schedule A. Payment shall be made as a percentage completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to install and test equipment as depicted in these Plans and Specifications.

Bid Item 4. Equipment Installation and Testing (Spring 2016)

a. Work required to complete the Equipment Installation and Testing (Fall 2016) pay item includes all labor and materials necessary to complete the following items:

   i. Installing, connecting, and testing components required for full hot water flushing, cold water flushing, and SVE operations.

b. Equipment Installation and Testing (Fall 2016) will be measured for payment as one lump sum, completed as specified.

c. Payment for this bid item will be made in accordance with the lump sum price for Bid Item "Equipment Installation and Testing (Fall 2016)" listed on Bid Form in Schedule A. Payment shall be made as a percentage completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to install and test equipment as depicted in these Plans and Specifications.

Bid Item 5. Winter Operation (2015-2016)

a. Work required to complete this pay item includes all labor and materials necessary to perform the following work:

i. Operate and maintain system components required for remote monitoring of subsurface and building interior conditions.

ii. All work required to facilitate winter operation and prevent damage to installed facilities from freezing and adverse weather.

b. Winter Operation (2015-2016) will be measured for payment by the calendar day of operation as specified. No compensation will be paid for any day, or portion of a day, during which the full remote monitoring systems are not operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "Winter Operation (2015-2016)" listed on Bid Form in Schedule A. Payment shall be made for each day of operations within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system as described in the Specifications.

Bid Item 6. HWF Operation (2016)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of HWF Operation during periods of hot water flushing including but not limited to, extraction water pumping and treatment systems, injection water heating systems, SVE system operation, system controls, oil skimmer operation.

ii. Provision of HWF Operation during periods of hot water flushing excludes utilities and oil disposal.

b. HWF Operation will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the HWF systems are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "HWF Operation (2016)" listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during HWF operations as described in the Specifications.

Bid Item 7. CWF Operation –With Chiller (2016)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of CWF Operation – With Chiller during periods of cold water flushing including but not limited to, extraction water pumping and treatment systems, injection water cooling systems (including chiller), SVE system operation, system controls, oil skimmer operation.

ii. Provision of CWF Operation – With Chiller excludes utilities and oil disposal.

iii. Furnish, install, and operate chiller to supplement injection water cooling system.

b. CWF Operation – With Chiller will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the CWF systems – With Chiller are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "CWF Operation – With Chiller (2016)" listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during CWF operations as described in the Specifications.

Bid Item 8. CWF Operation –Without Chiller (2016 - 2017)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of CWF Operation – Without Chiller (2016-2017) during the 2016 – 2017 fall through spring treatment period including but not limited to, extraction water pumping and treatment systems, SVE system operation, system controls, oil skimmer operation.

   ii. Provision of CWF Operation – Without Chiller (2016-2017) excludes utilities and oil disposal.

b. CWF Operation – Without Chiller (2016-2017) will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the CWF systems are not fully operational as a result of equipment or controls failure. Compensation will be paid for days when full or partial CWF Operations are not possible as a result of high groundwater conditions. It is anticipated that occasional, short term, full or partial system shutdown may be required during spring flooding/high water events.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "CWF Operation – Without Chiller (2016-2017)" listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during CWF operations as described in the Specifications.

Bid Item 9. Equipment Decommissioning and Removal

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Decommission treatment equipment and facilities and remove from the project site for re-use, recycle, or disposal by the Contractor. Equipment and facilities to be removed includes all temporary equipment enclosures, utilities, groundwater extraction pumps, oil skimmer equipment, vapor and liquid phase carbon vessels, boiler, chillers, heat exchangers, blowers, and equipment enclosures and covers.

   ii. Equipment and facilities to remain includes subsurface vaults, piping, cap materials, and sheet piling.

b. Equipment Decommissioning and Removal will be measured for as a lump sum for work complete, or portion thereof, completed as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "Equipment Decommissioning and Removal" listed on Bid Form in Schedule A. Payment shall be made as a percentage completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to decommission and remove treatment equipment.

Bid Item 10. GAC Change Out – Liquid Phase (2016)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of Liquid Phase GAC Change Out as required for system operation during the 2016 calendar year and includes disposal or recycle of GAC removed.

b. GAC Change Out – Liquid Phase will be measured for payment as a lump sum of GAC provided and installed complete as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "GAC Change Out – Liquid Phase (2016)" listed on Bid Form in Schedule A. Payment shall be made as a percentage complete within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to change out the lead liquid phase GAC(s) and switch the lag unit to lead, as described in the Specifications.

Bid Item 11. GAC Change Out – Vapor Phase (2016)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of Vapor Phase GAC Change Out as required for system operation during the 2016 calendar year and includes disposal or recycle of GAC removed.

b. GAC Change Out – Vapor Phase will be measured for payment as a lump sum for GAC provided and installed complete as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "GAC Change Out – Vapor Phase (2016)" listed on Bid Form in Schedule A. Payment shall be made as a percentage complete within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to change out lead vapor phase GAC(s) and switch the lag unit to lead, as described in the Specifications.

PART B – ADDITIVE ALTERNATE ITEMS

Alternate Item 1. HWF Operation (2017)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of HWF Operation (2017) during 2017 summer hot water flushing operations including but not limited to, extraction water pumping and treatment systems, injection water heating systems, SVE system operation, system controls, oil skimmer operation.

ii. Provision of HWF Operation (2017) excludes utilities and oil disposal.

b. HWF Operation (2017) will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the HWF systems are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "HWF Operation (2017)" listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during HWF operations as described in the Specifications.

Alternate Item 2. CWF Operation – With Chiller (2017)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of CWF Operation – With Chiller (2017) following 2017 HWF Operations including but not limited to, extraction water pumping and treatment systems, injection water cooling systems (including chiller), SVE system operation, system controls, oil skimmer operation.

ii. Provision of CWF Operation – With Chiller (2017) excludes utilities and oil disposal.

iii. Furnish, install, and operate chiller to supplement injection water cooling system.

b. CWF Operation – With Chiller (2017) will be measured for payment by the calendar day of operation, or portion thereof, completed as specified. No compensation will be paid for any day, or portion of a day, during which the CWF systems are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "CWF Operation – With Chiller (2017)" listed on Bid Form in Schedule A. Payment shall be made for units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during CWF operations as described in the Specifications.

Alternate Item 3. CWF Operation –Without Chiller (2017 - 2018)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of CWF Operation – Without Chiller (2017-2018) during the 2017 – 2018 fall through spring treatment period including but not limited to, extraction water pumping and treatment systems, SVE system operation, system controls, oil skimmer operation.

ii. Provision of CWF Operation – Without Chiller (2017-2018) excludes utilities and oil disposal.

b. CWF Operation – Without Chiller (2017-2018) will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the CWF systems are not fully operational as a result of equipment or controls failure. Compensation will be paid for days when full or partial CWF Operations are not possible as a result of high groundwater conditions. It is anticipated that occasional, short term, full or partial system shutdown may be required during spring flooding/high water events.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "CWF Operation – Without Chiller (2017-2018)" listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during CWF operations as described in the Specifications.

Alternate Item 4. GAC Change Out – Liquid Phase (2017)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of GAC Change Out – Liquid Phase (2017) as required for system operation during the 2017 calendar year and includes disposal or recycle of GAC removed.

b. GAC Change Out – Liquid Phase (2017) will be measured for payment as a lump sum of GAC provided and installed complete as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "GAC Change Out – Liquid Phase (2017)" listed on Bid Form in Schedule A. Payment shall be made as a percentage complete within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to change out the lead liquid phase GAC(s) and switch the lag unit to lead, as described in the Specifications.

Alternate Item 5. GAC Change Out – Vapor Phase (2017)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of Vapor Phase GAC Change Out (2017) as required for system operation during the 2017 calendar year and includes disposal or recycle of GAC removed.

b. GAC Change Out – Vapor Phase (2017) will be measured for payment as a lump sum for GAC provided and installed complete as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "GAC Change Out – Vapor Phase (2017)" listed on Bid Form in Schedule A. Payment shall be made as a percentage complete within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to

change out lead vapor phase GAC(s) and switch the lag unit to lead, as described in the Specifications.

Alternate Item 6. HWF Operation (2018)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of HWF Operation (2018) during 2018 summer hot water flushing operations including but not limited to, extraction water pumping and treatment systems, injection water heating systems, SVE system operation, system controls, oil skimmer operation.

   ii. Provision of HWF Operation (2018) excludes utilities and oil disposal.

b. HWF Operation (2018) will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the HWF systems are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "HWF Operation (2018)" listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during HWF operations as described in the Specifications.

Alternate Item 7. CWF Operation –With Chiller (2018)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of CWF Operation – With Chiller (2018) following 2018 HWF Operations including but not limited to, extraction water pumping and treatment systems, injection water cooling systems (including chiller), SVE system operation, system controls, oil skimmer operation.

   ii. Provision of CWF Operation – With Chiller (2018) excludes utilities and oil disposal.

   iii. Furnish, install, and operate chiller to supplement injection water cooling system.

b. CWF Operation – With Chiller (2018) will be measured for payment by the calendar day of operation, or portion thereof, completed as specified. No compensation will be paid for any day, or portion of a day, during which the CWF systems are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "CWF Operation – With Chiller (2018)" listed on Bid Form in Schedule A. Payment shall be made for units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during CWF operations as described in the Specifications.

Alternate Item 8. CWF Operation –Without Chiller (2018-2019)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of CWF Operation – Without Chiller (2018-2019) during the 2018 – 2019 fall through spring treatment period including but not limited to, extraction water pumping and treatment systems, SVE system operation, system controls, oil skimmer operation.

   ii. Provision of CWF Operation – Without Chiller (2018-2019) excludes utilities and oil disposal.

b. CWF Operation – Without Chiller (2018-2019) will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the CWF systems are not fully operational as a result of equipment or controls failure. Compensation will be paid for days when full or partial CWF Operations are not possible as a result of high groundwater conditions. It is anticipated that occasional, short term, full or partial system shutdown may be required during spring flooding/high water events.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "CWF Operation – Without Chiller (2018-2019)" listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during CWF operations as described in the Specifications.

Alternate Item 9. GAC Change Out – Liquid Phase (2018)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of Liquid Phase GAC Change Out – Liquid Phase (2018) as required for system operation during the 2018 calendar year and includes disposal or recycle of GAC removed.

b. GAC Change Out – Liquid Phase (2018) will be measured for payment as a lump sum of GAC provided and installed complete as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "GAC Change Out – Liquid Phase (2018)" listed on Bid Form in Schedule A. Payment shall be made as a percentage complete within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to change out the lead liquid phase GAC(s) and switch the lag unit to lead, as described in the Specifications.

Alternate Item 10. GAC Change Out – Vapor Phase (2018)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of Vapor Phase GAC Change Out (2018) as required for system operation during the 2018 calendar year and includes disposal or recycle of GAC removed.

b. GAC Change Out – Vapor Phase (2018) will be measured for payment as a lump sum for GAC provided and installed complete as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "GAC Change Out – Vapor Phase 2018)" listed on Bid Form in Schedule A. Payment shall be made as a percentage complete within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to change out lead vapor phase GAC(s) and switch the lag unit to lead, as described in the Specifications.

Alternate Item 11. HWF Operation (2019)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of HWF Operation (2019) during 2019 summer hot water flushing operations including but not limited to, extraction water pumping and treatment systems, injection water heating systems, SVE system operation, system controls, oil skimmer operation.

ii. Provision of HWF Operation (2019) excludes utilities and oil disposal.

b. HWF Operation (2019) will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the HWF systems are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "HWF Operation (2019)" listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during HWF operations as described in the Specifications.

Alternate Item 12. CWF Operation –With Chiller (2019)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of CWF Operation – With Chiller (2019) following 2019 HWF Operations including but not limited to, extraction water pumping and treatment systems, injection water cooling systems (including chiller), SVE system operation, system controls, oil skimmer operation.

ii. Provision of CWF Operation – With Chiller (2019) excludes utilities and oil disposal.

iii. Furnish, install, and operate chiller to supplement injection water cooling system.

b. CWF Operation – With Chiller (2019) will be measured for payment by the calendar day of operation, or portion thereof, completed as specified. No

compensation will be paid for any day, or portion of a day, during which the CWF systems are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "CWF Operation – With Chiller (2019)" listed on Bid Form in Schedule A. Payment shall be made for units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during CWF operations as described in the Specifications.

Alternate Item 13. CWF Operation –Without Chiller (2019-2020)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of CWF Operation – Without Chiller (2019-2020) during the 2019 – 2020 fall through spring treatment period including but not limited to, extraction water pumping and treatment systems, SVE system operation, system controls, oil skimmer operation.

   ii. Provision of CWF Operation – Without Chiller (2019-2020) excludes utilities and oil disposal.

b. CWF Operation – Without Chiller (2019-2020) will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the CWF systems are not fully operational as a result of equipment or controls failure. Compensation will be paid for days when full or partial CWF Operations are not possible as a result of high groundwater conditions. It is anticipated that occasional, short term, full or partial system shutdown may be required during spring flooding/high water events.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "CWF Operation – Without Chiller (2019-2020)" listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during CWF operations as described in the Specifications.

Alternate Item 14. GAC Change Out – Liquid Phase (2019)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of GAC Change Out – Liquid Phase (2019) as required for system operation during the 2019 calendar year and includes disposal or recycle of GAC removed.

b. GAC Change Out – Liquid Phase (2019) will be measured for payment as a lump sum of GAC provided and installed complete as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "GAC Change Out – Liquid Phase (2019)" listed on Bid Form in Schedule A. Payment shall be made as a percentage complete within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to

change out the lead liquid phase GAC(s) and switch the lag unit to lead, as described in the Specifications.

Alternate Item 15. GAC Change Out – Vapor Phase (2019)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of Vapor Phase GAC Change Out (2019) as required for system operation during the 2019 calendar year and includes disposal or recycle of GAC removed.

b. GAC Change Out – Vapor Phase (2019) will be measured for payment as a lump sum for GAC provided and installed complete as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "GAC Change Out – Vapor Phase (2019)" listed on Bid Form in Schedule A. Payment shall be made as a percentage complete within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to change out lead vapor phase GAC(s) and switch the lag unit to lead, as described in the Specifications.

Alternate Item 16. HWF Operation (2020)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of HWF Operation during periods of hot water flushing including but not limited to, extraction water pumping and treatment systems, injection water heating systems, SVE system operation, system controls, oil skimmer operation.

   ii. Provision of HWF Operation during periods of hot water flushing excludes utilities and oil disposal.

b. HWF Operation will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the HWF systems are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "HWF Operation (2020)" listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during HWF operations as described in the Specifications.

Alternate Item 17. CWF Operation – With Chiller (2020)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of CWF Operation during periods of hot water flushing including but not limited to, extraction water pumping and treatment systems, injection water cooling systems, SVE system operation, system controls, oil skimmer operation.

ii. Provision of CWF Operation during periods of cold water flushing excludes utilities and oil disposal.

iii. Furnish, install, and operate chiller to supplement injection water cooling system.

b. CWF Operation will be measured for payment by the calendar day of operation, or portion thereof, completed as specified. No compensation will be paid for any day, or portion of a day, during which the CWF systems are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "CWF Operation (2020)" listed on Bid Form in Schedule A. Payment shall be made for units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during CWF operations as described in the Specifications.

Alternate Item 18. CWF Operation –Without Chiller (2020-2021)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of CWF Operation during periods of cold water flushing including but not limited to, extraction water pumping and treatment systems, SVE system operation, system controls, oil skimmer operation.

ii. Provision of CWF Operation during periods of hot water flushing excludes utilities and oil disposal.

b. CWF Operation will be measured for payment by the calendar day of operation completed as specified. No compensation will be paid for any day, or portion of a day, during which the CWF systems are not fully operational.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "CWF Operation (2020-2021) – Without " listed on Bid Form in Schedule A. Payment shall be made for the units completed within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to operate the system during CWF operations as described in the Specifications.

Alternate Item 19. GAC Change Out – Liquid Phase (2020)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

i. Provision of GAC Change Out – Liquid Phase (2020) as required for system operation during the 2020calendar year and includes disposal or recycle of GAC removed.

b. GAC Change Out – Liquid Phase (2020) will be measured for payment as a lump sum of GAC provided and installed complete as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "GAC Change Out – Liquid Phase (2020)" listed on Bid Form in Schedule A. Payment shall be made as a percentage complete within the progress period. Payment for this bid item shall constitute full compensation for all labor,

supervision, materials, equipment, incidentals, and all other costs necessary, to change out the lead liquid phase GAC(s) and switch the lag unit to lead, as described in the Specifications.

Alternate Item 20. GAC Change Out – Vapor Phase (2020)

a. Work required to complete this pay item includes all labor and materials necessary to complete the following items:

   i. Provision of Vapor Phase GAC Change Out (2020) as required for system operation during the 2020calendar year and includes disposal or recycle of GAC removed.

b. GAC Change Out – Vapor Phase (2020) will be measured for payment as a lump sum for GAC provided and installed complete as specified.

c. Payment for this bid item will be made in accordance with the unit price for Bid Item "GAC Change Out – Vapor Phase (2020)" listed on Bid Form in Schedule A. Payment shall be made as a percentage complete within the progress period. Payment for this bid item shall constitute full compensation for all labor, supervision, materials, equipment, incidentals, and all other costs necessary, to change out lead vapor phase GAC(s) and switch the lag unit to lead, as described in the Specifications.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION 01275

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SECTION 01290

PAYMENT PROCEDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Format
B. Submittal Procedures
C. Applications for Payment
D. Invoices
E. Substantiating Data
F. Payment Terms and Retainage
G. Vendor's Release and Waiver of Lien Form

1.02 FORMAT

A. The Bid Form Schedule A, Schedule of Quantities and Prices, submitted by the Successful Bidder, as modified by any executed Change Orders, will be the basis of the Bid Form. The Engineer may request further breakdown of certain lump sum items to be included in the schedule of values as deemed necessary. The Schedule of Values will serve as the basis for progress payments and shall be incorporated by the Contractor into a form of Application for Payment.

B. The Contractor shall submit to the Owner and the Engineer an Application for Payment, and attach a separate invoice, for the work completed in the calendar month covered by that Application for Payment in a form acceptable to the Engineer.

C. The Contractor shall submit a release and waiver of lien in a format suitable to the Engineer (similar to the form attached to this section) with each invoice.

1.03 SUBMITTAL PROCEDURES

A. The Contractor shall submit the original Application for Payment and invoice covering the work performed in the most-recent progress estimate period, for each month for the duration of the Project to the Owner, and one copy to the Engineer for review.

B. Payment Period: The Contractor shall follow the payment terms specified in the Sample Contract provided with this document.

C. The Contractor shall prepare a final Application for Payment and invoice as specified in Section−01770 Closeout Procedures.

1.04 APPLICATIONS FOR PAYMENT

A. Applications for Payment shall be executed and certified by signature of an authorized officer of Contractor.

B. The Application for Payment shall be accompanied by a release and waiver of lien in a format similar to the form attached to this specification for the full amount of the application for payment.

C. The Contractor shall list original Work Order amount, and each authorized Change Order and Work Change Directive, listing Change Order or Work Change Directive number and dollar amount.

1.05 INVOICES

A. Each invoice shall be accompanied by the specified Application for Payment form and shall show the following:

1. The date of the execution of the Contract Agreement
2. Purchase Order Number
3. Purchase Order Date
4. The name of the Owner's Representative named on the Purchase Order
5. A description of the work performed. The description of the work shall include in a clear and legible format the precise location with stationing, the item quantity, and the percent of the total item completed for the period in addition adjacent to the original Plan quantity.

B. Invoices that include work performed on a force account basis shall be supported with copies of the force account sheets signed by the construction manager and superintendent the day of the work and copies of the appropriate daily time sheets. In addition, copies of the daily reports shall be attached to the force account. The Contractor shall attach photocopies of receipts for all materials and expenses claimed as backup for the force account work. Lack of proper and complete documentation for force account work will be just cause for non-payment of that work pending submittal of required full and complete item documentation. All documentation shall be submitted and approved prior to invoice submittal, e.g., force account shall be reviewed by the Engineer with the Superintendent prior to starting the work, and the Engineer shall sign the force account work sheet daily when force account is used. Under no circumstance are force account sheets to be held for review and signature beyond the next day. Delaying seeking review for signature by the Engineer shall place that work at high risk of non-payment. The Contractor shall submit backup copies of all required paperwork that was previously submitted as a part of a daily or weekly submittal.

1.06 SUBSTANTIATING DATA

A. The Engineer may request substantiating data for any claimed payment when the original request is insufficient or lacking proper information. When the Engineer requires substantiating data, the Contractor shall submit, within 30 days, data justifying the nature, scope, material used quality, and quantity of work as well as the dollar amount of the work at issue. The Engineer may conditionally approve any claimed payment pending submittal of acceptable substantiating data; however, unsubstantiated claims for payment will result in withholding of the unsubstantiated amounts from subsequent payment claims.

B. The Contractor shall submit one copy of substantiating data with a cover letter for each request for substantiating data. Each submittal of substantiating data shall show Application for Payment number and date, and pay item by number, and a complete description, including precise location and quantity of the item of work.

1.07 PAYMENT TERMS AND RETAINAGE

A. The Contractor is advised of the invoicing and payment terms outlined in the Sample Contract provided with this document. The Owner shall deduct and retain 10% of each invoice submitted by the Contractor as retainage. Retainage shall be paid to the Contractor upon satisfactory final completion of the project as specified in Section 01770 Closeout Procedures, and after 90 days have passed since the last day of Project work.

B. Major supplier and subcontractor releases of lien must be provided prior to initiation of final payment.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION 01290

Vendor's Release and Waiver of Lien Form Follow

BNSF – Skykomish School HWF Remediation

VENDOR'S RELEASE AND WAIVER OF LIEN

Name of Prime Contractor: _____
Name of Contractor: _____ under contract to Prime Contractor dated_____
Name of Vendor: _____
Project Name: _____
Project No.: _____
Principal: BNSF Railway Company
Original Contract:
Scope/Authorization Reference Dates: _____

Total Authorized Amounts:	$_____
Less Partial Payments:	$_____
Final Payment:	$_____

Upon receipt by VENDOR of a final payment in the above stated amount, or if paid by check, when said check has been paid by the bank upon which it is drawn, VENDOR does remise, release, and forever discharge Prime Contractor, Contractor and its Sureties, and the Principal from any and all actions, causes of actions, liens, bond rights, stop notices, debts, dues, accounts, covenants, agreements, judgments, claims, and demands of whatsoever nature or character which said VENDOR now has or ever has had against the Prime Contractor, Contractor or its Sureties, or the Principal, their successors and assigns, which shall have arisen or may arise out of or be incidental to work undertaken or done under or in connection with the Subcontract and related extra work or change orders thereto.

VENDOR certifies and warrants that all charges for labor, materials, supplies, equipment, lands, licenses, and other expenses for which the Prime Contractor, Contractor, or the Principal might by sued or for which a lien, stop notice, or bond claim might be filed, have been fully satisfied and paid and VENDOR agrees to defend and save harmless the Prime Contractor, Contractor and the material men or others, filed against the Prime Contractor, Contractor, or the Principal or the buildings, structures, additions, or improvements constructed under the Original Contract and arising out of the performance of the Subcontract work.

VENDOR hereby agrees that it will take all action necessary to remove all liens filed against or on Prime Contractor, Contractor, or Principal or the property of Prime Contractor, Contractor, or Principal arising out of the above-referenced Project. VENDOR hereby appoints Prime Contractor, or any of Prime Contractor's officers, directors, employees, or attorneys or agents to take all actions necessary to remove any liens that SUBCONTRACTOR may have placed on or against Prime Contractor, Contractor, or Principal or the property of Prime Contractor, Contractor, or Principal arising out of the above-referenced Project. VENDOR hereby grants the attorneys appointed above full power and authority to do everything necessary in exercising the powers granted by this instrument as fully as VENDOR might or could do as if personally present.

_____
ATTEST: VENDOR

_____ By_____
Name, Title: Name, Title:

Subscribed and sworn to before me this _____ day of _____, 2014.

_____Notary Public

BNSF – Skykomish School HWF Remediation

SECTION 01310

PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Contractor's Project Superintendent
B. Submittals
C. Project Meetings
D. Coordination – General
E. Coordination of Contractor's Work with Others
F. Layout of the Work

1.02 CONTRACTOR'S PROJECT SUPERINTENDENT

A. The Contractor shall employ a qualified Project Superintendent for the duration of the Project. The Project Superintendent shall be experienced in excavation of impacted soils, surface and subsurface demolition, excavation dewatering, coordinating truck transportation of soil, remediation equipment and infrastructure installation, and restoration surface features and utilities. The Project Superintendent shall have a minimum of five years of experience as a Project Superintendent on excavation projects of similar scope and comparable size as this Contract. The Contractor shall employ adequate project coordination staff to assist the Project Superintendent in the required control of subcontractors, obtaining permits and approvals, development of progress schedules, and preparation of submittals.

B. The Contractor shall employ a qualified Project Manager for the duration of the Project. The Project Manager shall have a minimum five years of experience as a project manager on renovation projects of similar scope and comparable size as this Contract.

C. The Contractor shall not change the Project Superintendent without prior written approval from the Engineer. The Contractor shall submit the resume of the superintendent, showing related experience and expertise, to the Engineer.

D. The Contractor's Project Superintendent shall be on the Project site at all times during the work, including any work performed by subcontractors. Should night shift work be scheduled, the Project Superintendent shall have the option of delegating responsibility to an acting night shift superintendent with prior written approval from the Engineer.

E. The Project Superintendent shall be responsible for the completion of the work in accordance with the Plans and Specifications, as well as for the following specific duties:

1. Coordinate the work of Contractor's labor, equipment, and material as well as that of subcontractors. The superintendent shall coordinate and interact effectively with the Owner, Engineer, and others responsible for other aspects of the Project.
2. Coordinate the schedule such that the various tasks are completed within the specified construction milestones.
3. Participate in regularly scheduled Project meetings with the Owner and Engineer.

4. Schedule and conduct meetings with subcontractors and other concerned parities as necessary to maintain the Project schedule, resolve issues in dispute, and efficiently coordinate use of utilities and other Project resources.
5. Ensure that quality control objectives are met and that quality control work is considered in the Project schedule so as to avoid delays in the Work.
6. Comply with Laws, Regulations, and Permit conditions.

1.03 SUBMITTALS

A. The Contractor shall prepare and transmit the following submittals and other submittals described in other sections of the Specifications, in accordance with the procedures of Section 01330 – Submittal Procedures:

1. The Contractor's Project Superintendent shall submit Contractor's Daily Construction Reports by noon the following working day.
2. The Contractor shall submit Applications for Payment as specified in Section 01290 – Payment Procedures.
3. The Contractor shall submit quality control reports, shop drawings, samples, certifications, information, and data as specified in other sections of these Specifications.
4. The Contractor shall develop, submit, and review weekly revisions and updates to the Project CPM Schedule and Technical Execution Plan at the weekly Project meeting as required by this Specifications Section 01325 – Progress Schedules and Reports.
5. Contractor shall submit weekly health and safety reports, as specified in Section 01150 – Health and Safety.

1.04 PROJECT MEETINGS

A. General:

1. The Engineer will schedule and provide meeting locations for all project coordination meetings throughout the progress of the Project work. The Engineer will prepare a meeting agenda in cooperation with the Owner and the Contractor, and distribute the agenda with written notice of each meeting to all parties. The Engineer will conduct the meetings. The Engineer will record minutes to include significant proceedings, decisions, and resolutions and reproduce and distribute copies of the minutes.

2. Representatives of Farallon, the Contractor Project Superintendent and project manager, and subcontractors, as appropriate, shall attend all weekly project coordination meetings. Others who are responsible for portions of the Project shall attend meetings as needed.

B. Weekly Progress Meetings:

1. The Contractor shall attend scheduled weekly progress meetings at the Project site in order to review work progress with the Owner and Engineer, resolve construction issues, describe the Project schedule, submittal status and delivery schedule, review contract modifications, health and safety, as well as other Project issues.
2. Attendees will include:
   a. The Engineer
   b. The Contractor's Project Engineer/Manager
   c. The Contractor Project Superintendent
   d. Subcontractors, and suppliers, as appropriate and as needed
   e. The Owner as determined appropriate
   f. A representative of the School
   g. A representative of Ecology as determined appropriate
   h. Others as appropriate.

C. Other meetings will be scheduled in accordance with the Specifications and as required by the Engineer in order to resolve Project issues.

D. Pre-installation Conferences:

1. When required in individual Specification Sections and/or as requested, convene pre-installation conference at work Site prior to commencing work of Section.
2. Require attendance of parties directly affecting, or affected by, work of specific Section.
3. Notify the Engineer four days in advance of meeting date.
4. Prepare agenda, preside at conference, record minutes, and distribute copies within two days after conference to participants.
5. Review conditions of installation, preparation and installation procedures, and coordination with related work.

1.05 COORDINATION – GENERAL

A. The Contractor shall coordinate scheduling, timely submittals, and the work of the various Sections of the Specifications, where feasible, to assure an efficient and orderly sequence of construction elements.

B. The Contractor shall coordinate and schedule Project work in full cooperation with the Engineer, the School, and the Town of Skykomish at the Project site.

C. The Contractor shall direct communications regarding Project work to the Engineer's designated Construction Manager. The Contractor shall neither discuss Project work nor take direction from any other contractor, consultant, public official, the media, Town of Skykomish staff, agency staff, or any other person without prior written approval by the Engineer.

D. The Engineer will designate a Project Construction Manager to carry out the duties of the Engineer at the Project site.

E. The Owner may designate a representative to monitor Project activity.

F. The Contractor's obligation to perform and complete the work depicted in these Plans and Specifications in accordance with the Contract Documents shall be binding and in accordance with these Specifications. The following actions will not constitute acceptance of work that is not in accordance with the Plans and Specifications nor will it constitute a release of Contractor's obligation to perform the work in accordance with these Contract Documents:

1. Observation by the Engineer
2. Recommendation of any progress payment or final payment by the Engineer
3. Use or occupancy of the work or any part thereof by the Engineer or others
4. Any acceptance by the Engineer, or failure to do so
5. Any review and approval of a submittal by the Engineer
6. Any inspection, test, or approval by others
7. Any correction of non-conforming work performed by the Engineer or others

G. Hazard Communication Program: The Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the site. The Contractor shall compile and properly file MSDS for all materials furnished by the Contractor or their subcontractors and suppliers.

1.06 COORDINATION OF CONTRACTOR PROJECT WORK WITH OTHERS

A. The Contractor shall be responsible for the individual tasks as well as the overall coordination of the work in accordance with the Construction Milestones set forth in Bid Form Schedule F. The Contractor shall obtain a schedule similar to the Contractor Progress Schedule from each of their subcontractors and shall be responsible for subcontractors maintaining these schedules and for coordinating any required schedule modifications.

B. The Contractor shall coordinate haul routes, any limitation on use of public streets, and obtain any needed permits or approvals for the use of the Town of Skykomish public roads.

C. The Contractor shall coordinate Project work with various utility companies serving the Project site and shall secure any required permits and approvals. The Contractor shall be solely and fully responsible for notifying utility companies (via One Call) per RCW Chapter 19.122, prior to commencing any work, and for response to any emergency that may arise on the Project during the course of the work. Certain active and inactive utilities may currently be present at the Project site, the exact location and type of which shall be determined by the Contractor without reliance on information provided by the Engineer. Several utilities may currently serve the Project site or adjacent properties including, but not limited to, the following:

1. BNSF
2. Electric
3. TV cable
4. Water

5. Storm sewer
6. Sanitary sewer
7. Telephone or other communication

1.07 LAYOUT OF THE WORK

A. The Contractor shall be solely responsible for laying out the Work, including lines and grades, and for their correctness and accuracy.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 01325

PROGRESS SCHEDULES AND REPORTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submittals
B. Construction Milestones
C. Progress Schedule
D. Daily Construction Report
E. Health and Safety Reports
F. Record Documents
G. Progress Schedule Reviews, Acceptance, Updates and Revisions

1.02 SUBMITTALS

A. Work and progress payments shall not start until an initial Progress Schedule is submitted by the Contractor, reviewed and approved by the Engineer. The Contractor shall submit a preliminary Baseline Schedule within fifteen (15) days after issuance of Notice to Proceed. Weekly updates of the Progress Schedule through the construction phase shall be submitted in accordance with the Submittal Procedures specified in Section 01330. The Project name and date of Submittal shall be on each sheet.

1.03 CONSTRUCTION MILESTONES

A. Specific requirements for phasing of the work are set forth in the Bid Form Schedule F, Construction Milestones. The initial Schedule shall be based on progress and completion of the work within the Construction Milestones and Contract Times listed in Bid Form Schedule F. In addition, the initial schedule shall reflect the various submittals required prior to the Notice to Proceed (NTP).

1.04 PROGRESS SCHEDULE

A. The Progress Schedule shall be a Gantt chart showing the proposed order of work, the expected beginning and completion times for the salient work features, predecessor(s) for each item, and the duration for each item. The Progress Schedule shall show each activity and, as a minimum, each activity description shall contain:

1. Activity name and identifying number
2. Predecessor(s)
3. Successor task(s)
4. Activity duration (in calendar days)
5. Percent complete
6. Float for each activity, where float is the amount of time that an activity can be delayed without delaying the start of the next activity

B. The Contractor's Progress Schedule shall be developed using the critical path method (CPM), Microsoft Project or equivalent software.

C. Activities

1. The Progress Schedule shall identify all major construction activities.

2. The Progress Schedule shall show all significant design, testing, submittals, manufacturing, shipping, construction, installation, commissioning and training activities, milestones for start of work, completion of construction phases, substantial completion, punch-list completion, physical completion, and final acceptance.
3. Any utility service interruptions necessary to perform the work shall be identified.
4. Provide a separate activity for each occasion where work is to be performed by others.
5. The Progress Schedule shall identify permits and approvals that are the responsibility of the Contractor.
6. The Progress Schedule shall identify and reflect all sub-contractor work.
7. The Progress Schedule shall identify draft invoice and final invoice submittal dates in accordance with the monthly closing dates established by the Engineer.

D. Explain any additional information or coding used.

E. The Contractor shall consider the normal calendar year, holidays, weather delays, long lead items, review times, Project phasing, Project site conditions and space availability in preparing the Progress Schedule.

F. The milestone completion dates required by the specifications, listed in the Schedule F Construction Milestones, shall be clearly identified on the Progress Schedule. The critical path shall be clearly indicated.

G. The Progress Schedule shall be updated and submitted weekly at the time of the weekly Progress Meeting and reviewed for the participants by the Contractor's project manager during the weekly Progress Meeting. In addition to the overall progress schedule, the Contractor shall prepare a two-week look-ahead schedule to be discussed in the weekly construction meetings. This look-ahead working schedule, in addition to providing the Engineer with information for Project coordination, shall also be used to inform Town officials, emergency responders, the school district, citizens, and media of construction impact. Copies shall be available to all meeting participants during the Weekly Progress Meeting.

1.05 DAILY CONSTRUCTION REPORT

A. The Contractor shall prepare a written Daily Construction Report in a format acceptable to the Engineer. An electronic copy of the Daily Construction Report in Microsoft Word or Excel format shall be provided at the Engineer's request. The Daily Construction Report shall be prepared for each day Contractor is on the Project Site and submitted to the Engineer no later than noon of the following working day.

B. Daily Construction Reports shall include:

1. Accidents, safety, and security issues
2. Number of workers for each trade and the names of the workers
3. Names of sub-contractors and their on-site foreman and employees
4. Hours of work for each trade or type of equipment
5. Equipment on the Project site and materials furnished
6. Names of Project visitors and agency or supplier they represent

7. Major work activities performed, and progress thereof, including estimated amounts of specialty work, excavation, stockpiling, loading, and backfilling work completed
8. Description of major construction issues should they be encountered including station, time, nature of impact, potential resolution
9. Weather conditions and temperature
10. Unforeseen subsurface conditions
11. A list of Submittals transmitted to or received from the Engineer
12. Meetings attended
13. Tests and inspections performed and the results of tests and inspections
14. Reason for construction delays should there be any
15. Units and description of force account work, subject to prior approval daily by the Engineer
16. Daily Trucking Logs as specified in Section 02110
17. Vehicle Inspection Logs as specified in Section 02130
18. Description of Temporary Erosion and Sediment Control daily maintenance and inspection

C. The Daily Construction Reports may be used to substantiate any claim for delay, impact, or change, and shall contain sufficient information to document each potential impact.

D. The Daily Construction Report may be used as a partial basis for documentation of force account work. The elements of any force account work reported by the Contractor's Project Superintendent shall be reviewed daily by the Engineer and are subject to prior review for approval by the Engineer; such review for approval shall be expedited by the Engineer to cause no delay to a time-sensitive operation. The Contractor's Project Superintendent shall promptly make any changes required by the Engineer, to the units of the force account work recorded on the Daily Construction Report.

1.06 HEALTH AND SAFETY REPORTS

A. The Contractor's Daily Construction Report shall include a summary of daily health and safety meetings, conferences, issues, incidents, near-misses, and actions taken to address and resolve health and safety issues.

B. Additional reporting requirements are provided in Specifications Section 01150 – Health and Safety Requirements.

1.07 RECORD DOCUMENTS

A. The Contractor shall maintain, in a secure place at the Project Site, one copy of all weigh tickets, approved details, plans and specifications, addenda, change orders, field orders, work change directives, submittals, laboratory data, survey data and written interpretations and clarifications, in good order and annotated to show all changes made during construction. These record documents shall be immediately available to the Engineer or BNSF upon request for inspection or review.

B. During the course of the work, the Contractor shall maintain the following records up-to-date at the Project Site at all times, and shall submit the following documents to the Engineer prior to final Application for payment.

C. General Records:

1. Contractor's Daily Construction Reports
2. Daily Safety Meeting minutes or notes
3. Health and Safety Incident (Accident) reports and Near-Miss Reports
4. Hot Work Permits
5. Minutes of all other Contractor meetings
6. Progress survey data for Excavation work including cross-sections and volume calculations

D. Test and Analytical Results: One copy of all test and analytical results

E. Bills of Lading: One Copy of all bills of lading for materials received

1.08 PROGRESS SCHEDULE REVIEWS, ACCEPTANCE, UPDATES AND REVISIONS

A. The initial Progress Schedule and all updates submitted by Contractor will be reviewed by the Engineer and shall be adjusted and resubmitted should the Engineer's review determine further information is needed for approval. The schedule will be reviewed for:

1. Proper application of CPM methodology and logic
2. A sequence of work that satisfies the requirements of the Contract Documents and is reasonable and logical
3. Activity durations that are within an expected range or that can be justified by the Contractor to the satisfaction of the Engineer

B. The Engineer's review and critique shall not be construed as an assignment of responsibility of performance to the Engineer.

C. The Contractor shall make all necessary revisions to the initial Progress Schedule based on the Engineer's review and resubmit within two days.

1. After the Engineer's review, the Contractor shall use the Progress Schedule for planning, organizing, and directing the Project work and for reporting progress.

   The Contractor shall bear sole responsibility for ensuring completion of the Project work within the allotted Contract Time. Failure to complete the Project within the Contract time shall result in the assignment of liquidated damages at amounts previously specified in Section 01250, Contract Modification Procedures.
2. The Engineer's acceptance of any Progress Schedule shall not transfer any of the Contractor's responsibilities to the Engineer. The Contractor alone shall be responsible for adjusting Contractor resources, forces, labor, equipment, and schedules to ensure completion of the Project work within the allotted time specified in the Contract Document.

D. Updates:

1. The Contractor shall keep the Progress Schedule current during the Project construction phase so that it is an accurate indication of Project progress and in order to visually see construction activity completion within the allotted Contract time. Updates shall include any field orders, work change directives, change orders, and delays and unresolved issues.
2. Activity descriptions shall not be changed.

3. Any changes in milestone dates must be approved in writing by the Engineer prior to such reflection. Changes in milestone dates will not be allowed where such a change will cause an extension of the project completion date without the execution of a formal change order.

E. Revisions:

1. In addition to weekly Progress Schedule submittals, the Contractor shall revise the Progress Schedule when additional work, delays, or accumulations of causes indicate the Contract Time needs to be exceeded. Contractor shall submit a written statement accurately and completely describing the cause(s) of the delay. This written statement shall also describe with sufficient back-up justification the additional Contract time or effort needed to successfully complete the Project.
2. The Contractor shall submit a revised Progress Schedule when it is apparent that the Contractor's schedule does not substantially match the actual progress and order of the Project work as measured by:
   a. Accumulated delays that exceed more than five percent of the allotted Contract Time or 15 calendar days, whichever is less.
   b. Critical path activity that is excessively restrained.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used

END OF SECTION 01325

BNSF – Skykomish School HWF Remediation

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submittal Procedures
B. Requests for Information
C. Startup Submittals
D. Outline of Contractor's Technical Execution Plan

1.02 SUBMITTAL PROCEDURES

A. The Contractor shall transmit each Submittal to the Engineer's representative at the Project site.

B. The Contractor shall provide each Submittal in electronic form (Adobe pdf format) to the Engineer.

C. The Contractor shall transmit each Submittal with a cover letter signed by the Contractor's Project Superintendent. The Contractor shall, by signing each Submittal, certify that the Contractor has reviewed the Submittal, and that the submitted information conforms to the requirements of the Work and these specifications.

D. The Contractor shall sequentially number the transmittals (e.g., Submittal No. 001). The Contractor shall number revised Submittals with original number and a sequential alphabetic suffix (e.g., Submittal No. 001a).

E. Each Submittal shall include Project title, Contractor, Sub-Contractor or Supplier, title of Submittal, applicable Specification Section number and paragraph and, if applicable, Plans sheet number.

F. Submittals that do not conform to the requirements of the Specifications will be returned with a notation of deficiencies. The Contractor shall revise to correct noted deficiencies and resubmit. When revised for resubmission, the Contractor shall identify all changes made since previous submission.

G. Submittals not required by the Specifications will not be recognized or processed.

H. Submittals must be submitted at least 14 calendar days prior to the work for which they apply is scheduled.

I. Shop Drawings:

1. Quality: Prepare shop drawings accurately to scale sufficiently large to indicate pertinent features of the products and the method of fabrication, connection, erection, or assembly with respect to the Work. Calculations associated with shop drawing design shall also be submitted.
2. Documents submitted to the Engineer and not returned to the Contractor, shall be retained by the Engineer.

J. Manufacturer's Literature:

1. Product data, catalog cuts, or brochures shall show the type, size ratings, style, color, manufacturer, and catalog number of each item and be complete enough to provide for positive and rapid identification in the field. Submit catalog data in an orderly form. Specific items shall be clearly marked. General catalogs or partial lists will not be accepted.

K. Samples:

1. The sample submitted shall be the exact or precise article proposed to be furnished.
2. Submit three (3) samples of each article proposed.

1.03 REQUESTS FOR INFORMATION

A. The Contractor shall submit all requests for information to the Engineer in writing. Requests for information shall be numbered sequentially and shall include the related Specification Section number or Plans sheet number.

B. The Engineer will provide any revisions to the Specifications or Plans in writing.

C. The Contractor shall request written confirmation of any interpretations or clarifications provided verbally by the Engineer.

1.04 STARTUP SUBMITTALS

A. This paragraph specifies Submittals that the Contractor shall prepare and transmit prior to commencing the Work at the Project site.

1. The Contractor shall submit the initial Progress Schedule as specified in Section 01325 – Progress Schedules and Reports.
2. The Contractor shall submit the Contractor's updated HASP as specified in Section 01150 – Health and Safety Requirements, including documentation of workers' OSHA training and medical monitoring and BNSF e-RailSafe and contractor orientation training certifications.
3. The Contractor shall submit documentation of the proposed backfill materials and source of supply as specified in Section 02310 – Backfilling and Grading.
4. Certain parts of the Work are performance-based, requiring the Contractor to provide detailed written information for review, comment, and approval by the Engineer, regarding the means and methods proposed by the Contractor to execute the Work. The Contractor shall submit a draft Technical Execution Plan for the Work conforming to the outline specified in Paragraph 1.05, for the Engineer's review and comment within two (2) weeks of the notice to proceed. The Contractor shall revise the draft Technical Execution Plan as requested by the Engineer and submit a final draft Technical Execution Plan, subject to the Engineer's review, approval, and acceptance, one (1) week after receiving the Engineer's comments.

1.05 OUTLINE OF CONTRACTOR'S TECHNICAL EXECUTION PLAN

The Technical Execution Plan shall include work activities, project controls, and procedures. The Engineer and the School District shall review the Technical Execution Plan for conformance with

established project objectives. The Technical Execution Plan shall include the following sections:

A. Section A: Project Coordination:

1. Resume of Project Superintendent(s).
2. Identification of key personnel.
3. Emergency and after hours calling list, including Contractor, Engineer, Owner and local municipal contacts.
4. Detailed project staffing plan showing staffing levels for each task and phase of Work, along with any plans for shift work.
5. List of Major Equipment, Systems, and Material, other than listed in Bid Form Schedule E.
6. List of Permits and Approvals to be obtained by Contractor, including contact names, titles and phone numbers.

B. Section B: Progress Schedule:

1. Contractor's initial progress schedule, based on the Construction Milestones listed in the Bid Form.
2. Table of estimated production rates and equipment necessary for Contractor to meet the required Construction Milestones.

C. Section C: Construction Facilities and Temporary Controls:

1. A drawing that shows the layout of the construction facilities and temporary controls, including work zones (i.e., Support Zone, Exclusion Zone, and Decontamination Zone), water storage tanks, stockpile areas, haul roads, trailer locations, parking areas for construction equipment and personal vehicles, and other pertinent features.
2. Dust Control Plan as specified in Section 01580- Environmental Control
3. Proposed Design of Decontamination Stations
4. Traffic & Trucking Plan as specified in Section 01500-Temporary Facilities and Controls
5. Decontamination Methods and Equipment as specified in Section 02130-Decontamination
    a. Procedures to prevent contamination of clean areas
    b. Vehicle decontamination and inspection procedures
    c. Procedures for collection, treatment, and disposal or discharge of decontamination residuals and used PPE
    d. Waste minimization procedures.

D. Section D: Site Preparation:

1. Detailed description of clearing and grubbing, demolition of surface and subsurface structures, and description of construction equipment and methods associated with these activities.
2. Provide spill response subcontractor information; spill response procedures.

E. Section E: Construction of Facilities:

1. Detailed description of excavation equipment and methods for surface and subsurface excavations, including specific description for working on and removing materials below standing water within trenches and the remedial area,

including method for determining excavation floor limits and method for assisting Engineer with gathering samples for contamination determinations during the excavation operations in various areas.

2. Excavation production rates in the form of a table of excavation volumes per week for each week of the Project schedule.
3. Proposed stockpile locations and construction; methods and facilities for managing stormwater run-on/runoff from stockpile areas, and excavation areas.
4. Coordination of excavation, stockpiling, and loading.
5. Coordination of backfilling and grading.
6. Installation of facilities, including sheep pile wall, process wells and piping, controls, and equipment.

F. Section F: Oil Recovery:

1. Materials and methods for recovery of oil.

G. Section G: Utility Work:

1. Materials and methods for utility installation.

H. Section H: Restoration:

1. Description of restoration construction activities, including sidewalk, and landscaped areas restoration.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION 01330

BNSF – Skykomish School HWF Remediation

SECTION 01410

REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Permits and Approvals
B. Laws and Regulations

1.02 PERMITS AND APPROVALS

A. Unless otherwise specifically provided in paragraph 1.02.B of this Section, the Contractor shall obtain and pay for all the construction permits, licenses, governmental charges, and inspection fees necessary for the performance of the Project work. The Engineer will assist Contractor, when necessary, in obtaining such permits and approvals.

B. The Engineer will complete and submit permit applications, demonstrate meeting substantive requirements, and pay the fees for the following permits and approvals if applicable:

1. Washington State Permits
    a. Environmental Policy Act (SEPA): Washington State Environmental Policy Act (SEPA) provides a way to identify and mitigate probable environmental impacts that may result from governmental decisions. Ecology is the lead SEPA agency and has issued a Final Environmental Impact Statement for the project.
2. General Construction Stormwater Permit: General construction stormwater permit is required by Ecology for discharge of stormwater to a surface water body (i.e., South Fork Skykomish River) and/or storm drains that discharge to a surface water body. Because this project is under a Consent Decree, no formal permit is required, but the substantive requirements of the permit must be met. The NPDES permit issued for this project encompasses the General Construction Stormwater Permit and requires the preparation and implementation of a Stormwater Pollution Protection Plan (SWPPP). A copy of the SWPPP was included with the Specifications.
3. Town of Skykomish Permits
    a. Zoning and Land Use Permits: Because this work is being conducted under a Consent Decree with Ecology, no formal Zoning or Land Use Permits are required, but the substantive land use and zoning requirements of the Town of Skykomish must be met.
    b. Critical Area Ordinance (CAO): The Town of Skykomish developed the CAO to designate and classify environmentally sensitive and hazardous areas and to protect these areas and their values. The Town will review the proposed work, determine whether it will adversely affect critical areas as outlined in the CAO, and recommend mitigation measures to Ecology based on the Town's existing substantive requirements in its CAO. Ecology will determine whether the proposed work complies with the substantive requirements of the CAO and other local land use and development standards.

c. Clearing and Grading Permit: Clearing and Grading Permit is reviewed under the Town of Skykomish Ordinance Number 267. The Town will also review the proposed work and recommend mitigation measures to Ecology based on the Town's existing substantive requirements in Ordinance No. 267. Ecology will determine whether the proposed work complies with the substantive requirements of Ordinance No. 267 Floodplain Work Approval: The project is located in a mapped 100-year floodplain (A or V zone), the local government (Skykomish) requires that a permit be obtained prior to development. Because this work is under an administrative order or a Consent Decree with Ecology, no formal permit is required, but the substantive requirements of the permit must be met.

C. The Contractor shall complete and submit permit applications that meet the substantive requirements of following permits and approvals:

1. Permit for the excavation support system (i.e., shoring), if necessary, from the Town of Skykomish per International Building Code.
2. Disposal Facility Waste Profile Approval pertaining to disposal of decontamination water from the Project site at an appropriately licensed facility.
3. Electrical permits from the Washington State Department of Labor and Industries (L&I). All electrical work will be completed in compliance with L&I regulations. Copies of all L&I permits shall be submitted to the Engineer.

D. Coordination of Permit Notifications and Inspections

1. The Engineer will provide the Contractor with a list of permit notification and inspection requirements associated with the items listed in B above.
2. The Contractor shall be responsible for coordinating required notifications and inspections in items B and C (above) with the Engineer and the permitting authority so that there is no delay in the work. Permit notification and inspection times shall be considered by the Contractor in developing the schedule of work. No additional time on the schedule or relief from liquidated damages will be granted to the Contractor for the time required for permit inspections by any agency.

1.03 LAWS AND REGULATIONS

A. Contractor shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither the Owner nor the Engineer, will be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Project work knowing or having reason to know that it is contrary to Laws and Regulations, it shall be the Contractor's primary responsibility to make certain that the Plans and Specifications are in accordance with Laws and Regulations.

C. Set forth below and in Section 1.02 are some of the laws and regulations applicable to this Project. The listing of specific laws and regulations in this section is for information only. The fact that a law or regulation is not listed does not relieve the Contractor of responsibility for compliance.

D. Where two or more regulations/documents conflict, the one(s) offering the greater or greatest degree of protection will be applied. The on-site Contractor(s) will comply with any and all state and local ordinances and regulations.

1. Town of Skykomish Codes and policies
   a. Noise Ordinance
   b. Building Permit (shoring)
   c. Stormwater, Grading and Drainage Control Code
2. State laws, regulations, and policies
   a. The Puget Sound Clean Air Agency Regulations for Air Quality Control include provisions restricting emissions of fugitive dust. Fugitive dust is defined as "solid airborne particulate matter emitted from any source other than through a stack, vent, or chimney."
   b. Washington Industrial Safety and Health Act rules for workplace safety and health regulations.
   c. State of Washington Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC.
   d. Title 296—Department of Labor & Industries, Chapter 296-155 WAC specifies health and safety standards for responding to releases or substantial threats of releases of hazardous substances at hazardous waste sites.
3. Federal laws and regulations
   a. Resource Conservation and Recovery Act (42 USC 6901 et.seq.) - This statute governs the generation, transportation, storage, and final disposal of hazardous waste. Soils containing constituents that are defined as RCRA hazardous wastes must be disposed of at RCRA-licensed facilities and must be appropriately manifested.
   b. Hazardous Waste Regulations (40 CFR 260 - 280) - These regulations provide specific requirements for handling, transporting, and disposing of hazardous waste.
   c. Carriage by Public Highway (49 CFR 177) - These regulations prescribe requirements that are applicable to the acceptance and transportation of hazardous materials by various carriers in motor vehicles.
   d. OSHA Standards for Hazardous Waste Site Operations and General Construction Activities (29 CFR 1910.120, 1926) - These regulations protect the health and safety of on-site workers at construction sites.
   e. National Fire Protection Association (NFPA), Flammable and Combustible Liquids Code, NFPA 30, most recent revision.
   f. American National Standards Institute (ANSI), Practices for Respiratory Protection, Z88.2, most recent version.
   g. ANSI, Emergency Eyewash and Shower Equipment, Z358.1, most recent version.
   h. ANSI, Protective Footwear Z41.1, most recent version.
   i. ANSI, Respirator Use Physical Qualification for Personnel, Z88.6, 1984.
   j. ANSI, Practice for Occupational and Educational Eye and Face Protection, Z87.1, most recent version.
   k. Departments of Transportation (DOT) Standards and Regulations, 49 CFR 171 and 49 CFR 172.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used

END OF SECTION 01410

BNSF – Skykomish School Remediation

SECTION 01450

QUALITY CONTROL

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Permits and Approvals
B. Quality Control Organization
C. Contractor Responsibilities
D. The Engineer's Responsibilities
E. Storage and Protection
F. Materials and Equipment
G. Product Options
H. Substitutions
I. Laboratory and Testing Requirements

1.02 PERMITS AND APPROVALS

A. The Contractor shall submit one copy of all testing results, quality control reports, and other quality control documentation to the Engineer. The documentation submitted shall be clearly marked as to whether or not the test results meet the requirements of the Specifications.

B. Contractor's Daily Construction Report, as required by Section 01325 – Progress Schedules and Reports, shall include daily reporting of quality control information and issues.

1.03 QUALITY CONTROL ORGANIZATION

A. The Contractor's Project Superintendent shall be responsible for coordinating all quality control tests performed by Contractor during the work, including testing of work or materials of Contractors and Suppliers.

B. The Contractor's Project Superintendent shall report directly to the Engineer with regard to quality control issues.

C. Corrective action shall be undertaken by the Contractor for all work and test results that do not meet Specifications. Testing shall be repeated at Contractor's cost until satisfactory results are obtained or the Contractor shall correct the work. The Engineer will determine when results satisfactorily meet the Plans and Specifications. All results shall be made available to the Engineer for review.

1.04 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall provide for the services of an independent qualified laboratory or testing services provider to perform the following testing and sampling:

1. Field sampling and density testing to verify and document compaction of backfilling and grading work, including trench work.
2. Geotechnical and chemical testing of soil materials as required in Sections 02310 – Backfilling and Grading, and 02060 – Aggregate Materials.

B. The Contractor shall complete all other testing required by the Specifications or Change Orders, or to complete all Contractor work in accordance with applicable codes and permits.

C. The Contractor's Project Superintendent shall control the Project work to the extent necessary to achieve specified quality and ensure conformance with the Contract Documents.

D. The Contractor's Project Superintendent shall receive testing results and shall ensure that appropriate corrections, including rework if necessary, are made by Contractor. All test results shall be forwarded to the Engineer immediately upon receipt. In the case of field compaction testing results, the Engineer shall be made aware of testing results that do not meet the specified requirements within four hours of the field testing that shows the deficiency.

E. The Contractor's Project Superintendent shall ensure that emissions of dust do not exceed the applicable levels during performance of the work, and shall take immediate corrective measures, including stopping work, whenever emissions are observed.

F. The Contractor's Project Superintendent shall ensure that all materials meet the requirements of the applicable Specifications.

G. The Contractor is responsible for analytical testing of decontamination water for profiling and disposal purposes.

H. The Contractor is responsible for ensuring that impacted soil and debris is placed in the impacted disposal stockpiles and not placed in the overburden (un-impacted) stockpiles or imported material stockpiles. The Contractor is responsible for removing any contaminated soils placed in the clean soil stockpile at the direction of the Engineer.

1.05 THE ENGINEER'S RESPONSIBILITIES

A. The Engineer's control of the work will include authority for on-the-spot stopping or slowing of work if it does not conform to quality control or Specification tolerances. The Engineer's judicial exercise of stop-work directives will only be through the Contractor's Project Superintendent. Such directives shall not be reason for additional compensation.

B. The Engineer will have authority to instruct the Contractor to immediately stop work if dust emissions or excessive hazardous emissions are detected at any time and are at risk of exceeding ecological standards or if, in the Engineer's opinion, an imminent threat to the health or safety of any person exists. The Engineer's authority to consult with the Contractor's superintendent to stop the work shall not relieve Contractor of the sole responsibility for observation and control of emissions and for the health and safety of Project personnel. The Engineer will exercise this authority only in consultation with the Contractor's superintendent and only when an imminent risk of violation of ecological standards exists.

C. The Engineer will be responsible for reviewing all quality control data generated by the Contractor. The Engineer's review of data does not relieve the Contractor of the responsibility to ensure that all work conforms to the Specifications.

D. The Engineer will be responsible for Confirmation Sampling of excavation floors and sidewalls with the aid of the Contractor's labor and equipment, and evaluation of the results of Confirmation Sampling.

E. The Engineer will be responsible for any sampling and analysis required for off-site disposal of excavated impacted soil and debris.

F. The Engineer will be responsible for in-situ profiling of overburden material. The Contractor shall assist the Engineer in procuring the samples as described in Section 02110 – Excavation and Stockpiling of the Specifications.

G. The Engineer will be responsible for analysis and quality assurance of perimeter air monitoring samples. The Contractor shall ensure that dust emissions shall not exceed 5 mg/m^3 at any point during the course of work activity at the Project site. In the event perimeter air monitoring readings exceed 5 mg/m^3, the Engineer will direct the Contractor's superintendent to stop work immediately and apply corrective measures for control of dust emissions without any additional cost to Owner. Sufficient dust control continually applied shall be used to avoid such shut-downs.

1.06 STORAGE AND PROTECTION

A. Contractor shall:

1. Store and protect products and materials in accordance with manufacturers' instructions. Store, secure, and protect from environmental damage and unauthorized usage.
2. Fuel storage and dispensing shall be per Section 01500−Temporary Facilities and Controls. Take precaution to avoid fuel spillage. In the event of an inadvertent spill, clean up immediately and thoroughly.
3. All equipment shall have a spill kit on-board. Operators shall be trained and experienced in the proper use of spill kits.
4. Equipment shall be maintained continually to not spill fuel, brake, or hydraulic fluid. Any inadvertent spill shall be cause for excavation operation shutdown and immediate cleanup of the spill. The machine with the broken hydraulic line or brake line shall be removed from the excavation site or repaired immediately. Hydraulic lines shall be inspected prior to delivery to the Project and replacements made where needed in order to avoid hydraulic line breaks during operation on the Project. This shall apply to track-hoe excavators, backhoes, front-end loaders, dozers, dump trucks, compactors, and water wagons delivered for Project work. The time and cost of any spillage caused by a hydraulic line break shall be tracked via time and materials method and deducted from the Progress Estimate for that month.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. The Contractor shall provide all materials and equipment necessary for the work unless otherwise specified.

B. Material shall be provided in accordance with these Plans and Specifications.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or descriptions may be proposed for this Project.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications; no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions or Equal Products: Submit a written request for substitution for any manufacturer not named in accordance with the following article.

2.03 SUBSTITUTIONS

A. Contractor shall document each request for substitution with complete data substantiating compliance of proposed substitution with the requirements of the Contract Documents.

B. Substitution Submittal Procedure:

1. Submit an electronic copy in Adobe pdf format of the request for substitution. Each request shall be limited to one proposed substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof shall be on the Contractor.
3. The Engineer will notify the Contractor in writing within 15 days of receipt of the proposed change of the decision to accept or reject the substitution request.

PART 3 – EXECUTION

3.01 LABORATORY AND TESTING REQUIREMENTS

A. The materials laboratory company proposed by the Contractor for acceptance on this Project shall meet the following requirements:

1. American Association for Laboratory Accreditation.
2. Washington Association of Building Officials certification.
3. Qualifications Reviewed and Accepted by the Engineer prior to performing any Project work.
4. An organization independent from the Contractor and all sub-contractors, unless prior written approval is received from the Engineer.

END OF SECTION 01450

BNSF – Skykomish School HWF Remediation

SECTION 01500

TEMPORARY FACILITIES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submittals
B. Electric Service
C. Lighting
D. Temporary Sanitary Facilities
E. Facility Support Items
F. Work Zones
G. Enclosures and Fencing
H. Protection of the Work
I. Temporary Erosion and Sediment Controls
J. Haul Roads and Access Roads
K. Traffic and Trucking Plan
L. Parking
M. Progress Cleaning and Waste Removal
N. Stockpile Areas
O. Field Office and Sheds
P. Removal and Restoration of Utilities, Facilities, and Controls
Q. Fuel Storage and Dispensing
R. Security
S. School Fuel Facilities

1.02 SUBMITTALS

A. The Contractor shall prepare and submit a Technical Execution Plan in accordance with Section 01330 – Submittal Procedures, including a section on construction facilities and temporary controls.

B. Contractor's Technical Execution Plan shall include a drawing that shows the layout of the construction facilities and temporary controls, including work zones (i.e., Support Zone, Exclusion Zone, and Decontamination Zone), stockpile areas, haul roads, trailer locations, parking areas for construction equipment and personal vehicles, and other pertinent features. Note that other technical execution plan requirements are listed elsewhere in these Specifications, and this section is not intended to be a full list of requirements.

1.03 ELECTRIC SERVICE

A. A licensed electrician retained by the Contractor shall perform all electrical work required for the Project.

B. The Contractor shall provide electrical power service for the Project or furnish and install electrical service from nearest appropriate transformer location. The Contractor shall furnish and install main service disconnect and over-current protection. The Contractor shall furnish and install electrical connections from main service disconnect to Contractor's facilities and equipment, to the Contractor's field office trailers including

the Engineer's office trailer. The Contractor shall be responsible for providing power to the Engineer's office trailer for the duration of the project.

C. The Contractor shall pay all electric usage costs necessary for the Work.

D. All electrical connections shall meet appropriate National Electrical Manufacturers Association (NEMA) ratings consistent with the intended service.

E. The Contractor shall coordinate with local electric utility and obtain any necessary permits.

1.04 LIGHTING

A. The Contractor shall provide and maintain portable high-intensity lighting plants with generators for illumination of the work area when Project work is performed before sunrise or after sunset.

1.05 TEMPORARY SANITARY FACILITIES

A. The Contractor shall provide and maintain temporary portable chemical toilet facilities. The facilities shall be provided at time of Project mobilization and maintained in clean and sanitary condition at all times during the Project until Substantial Completion. The Contractor shall provide a sufficient number of portable toilets for Contractor and Sub-Contractor work crews, the Engineer, Owner, and visitors in accordance with usage ratings, or as otherwise directed by the Engineer. This will require that portable toilets are located by the construction trailers and by the excavation.

B. The Contractor shall provide and maintain in clean, good working order, a water hand washing facility for personal decontamination.

C. The Contractor shall provide and maintain in clean, good working order, an emergency decontamination and eye wash station.

D. The Contractor shall provide and maintain, in clean, good working order, any other personal decontamination facilities, as directed by the Engineer and required by the HASP.

E. Contractor personnel shall <u>not</u> use School bathroom or locker room facilities.

1.06 FACILITY SUPPORT ITEMS

A. The Contractor shall provide equipment decontamination area(s) as required for the work, as discussed in Section 02130 - Decontamination.

1.07 WORK ZONES

A. When working with impacted materials the Contractor shall establish a Support Zone, Exclusion Zone, and Decontamination Zone, as defined herein.

1. The Contractor shall lay out the work zones and establish boundaries, barriers, facilities and controls to ensure that all personnel and equipment exiting the

Exclusion Zone pass through the Decontamination Zone before entering the Support Zone and before exiting the Project site.

2. Support Zone:
   The Contractor shall establish a Support Zone for field offices, storage, sanitary facilities, hand washing facilities, and non-construction vehicle parking.
3. The Support Zone shall be an area free of physical and chemical hazards.
4. The Contractor shall maintain the Support Zone in a safe, clean, orderly, and sanitary manner at all times.

B. Exclusion Zone:

When working with impacted materials the Contractor shall establish an Exclusion Zone using the following criteria and other criteria deemed necessary by the Engineer:

1. Open excavation areas shall be included in the Exclusion Zone.
2. Consideration of meteorological conditions and the potential for contaminants or other materials to be blown or washed from the area.
3. OSHA regulations and other applicable Laws and Regulations.

C. Temporary Activity Zones within Exclusion Zone:

When working with impacted materials the Contractor shall establish Temporary Activity Zones within the Exclusion Zone using high-visibility warning tape fastened to metal posts or weighted barrels to delineate areas where specific types of Work tasks will take place. Temporary Activity Zones shall be revised as necessary and as the Work progresses. Temporary Activity Zones shall be established to include the following tasks:

1. Excavation: Excavation areas shall be marked with orange construction fence at all times.
2. Material Screening: Screening equipment and operation, if necessary, shall be established and maintained as Temporary Activity Zones.
3. Stockpiling: Stockpile areas shall be established as Temporary Activity Zones and signs installed to indicate the type of material stockpiled in each stockpile area. Signs may consist of high-visibility spray paint on the plastic membrane stockpile cover.
4. Storage: Storage areas for materials or equipment shall be established and maintained as Temporary Activity Zones.
5. Decontamination: Any temporary decontamination areas shall be marked as Temporary Activity Zones.

D. Decontamination Zone:

When working with impacted materials the Contractor shall establish a Decontamination Zone between the Support Zone and the Exclusion Zone.

1. The Contractor shall provide suitable facilities for personnel decontamination in the Decontamination Zone, including emergency eyewash, and hand washing facilities.
2. The Contractor shall construct a vehicle and equipment decontamination facilities as required to prevent the spread of contaminated material beyond the Decontamination Zone.
3. The Contractor shall inspect and document inspection of each rail car and/or truck bound for landfill disposal of impacted soil and debris. The Contractor shall be responsible to ensure that each rail or truck container bound for landfill disposal of

impacted soil and debris is free of holes, tears, punctures, gaps or other similar outlet that could allow for the inadvertent release of impacted soil and debris. If the floor or walls of a rail or truck container is found to have an opening in it, the Contractor shall take measures to adequately cover the opening with plywood, sand bags or other adequate means to prevent material from inadvertently leaking out of the container. Repair of any holes in the floor or sides of the railcars shall be accomplished on a time and materials basis.

4. The Contractor shall inspect all vehicles and equipment that have been in Exclusion Zone prior to exiting the Exclusion Zone. The Contractor shall remove loose mud and debris from all rail cars and vehicles that have been in Exclusion Zone prior to movement of equipment between Exclusion Zone and non-Exclusion Zone areas of the Site.
5. The Contractor shall provide splash protection around the vehicle decontamination facility. Splash protection shall minimize potential contamination from splatter and mist during the vehicle and equipment decontamination process. Splash protection shall be temporary, but stable, and capable of being dismantled in the event of high winds.
6. The Contractor shall provide a drainage and collection systems for water generated during decontamination procedures as required.

1.08 ENCLOSURES AND FENCING

A. The Contractor shall furnish, install and maintain temporary fencing around all stockpile areas, excavation areas, process areas, work zones, and other areas as indicated on the Plans. The Contractor shall constantly secure barriers and enclosures in a manner to prevent unauthorized entry into construction areas.

B. The Contractor shall install temporary fence along the perimeter of the Project Area (per the construction phasing plan) as specified on the Plans. Temporary fencing around the project area shall be equipped with slats, screening, or other means of prohibiting off site observation of ongoing project work.

C. The Contractor shall furnish and post signs at every entrance and gate and at least every 50 feet along the fence warning the general public that the Project site contains physical and chemical hazards and that access is forbidden to unauthorized persons.

D. The Contractor shall furnish and post a professionally lettered sign, minimum size 4 feet by 4 feet, at each entrance, or gate to the site with the following text, or other similar text approved by the Engineer.

> "All Personnel and Visitors Beyond This Point Must Wear Hard Hat, Safety Glasses, High-Visibility Vest and Steel Toe Boots"

E. The Contractor shall provide temporary enclosures and/ or sheet partitioning as need to prevent intrusion of dust, odors, and water into non-construction areas.

1.09 PROTECTION OF THE WORK

A. The Contractor shall protect installed Work and provide special protection with regard to preventing the spread of contaminants to areas outside the Exclusion Zone. The

Contractor shall be responsible for all costs associated with removal and/or cleanup of soil or impacted materials tracked or spilled outside the Exclusion Zone.

B. The Contractor shall conduct a pre-construction video survey of the school property and submit to the Engineer prior to mobilization. This survey shall include both the school building and the teacherage. This video shall contain a time and date stamp.

C. The Contractor shall protect the existing catch basins and subsurface facilities by such means as determined by Contractor to be adequate for such protection, unless such facilities are designated on the Plans for removal. Damaged facilities shall be repaired or replaced at the Contractors expense as determined by the Engineer.

D. The Contractor shall protect School and Teacherage building structures. Any damage to School or Teacherage building structures will be repaired to original conditions as determined by the pre-construction video survey, as approved by the Department of Archaeology and Historic Preservation, RCW 1927.120, and as approved by the Engineer.

E. The Contractor shall maintain access to the School's Fire Department Connection on the South side of the building. Access must be maintained at all times so that the Fire Department may use in the event of a fire, and system readiness must be maintained throughout construction. If an extension is provided, it must be verified that the design flow rate of the residual pressure is maintained. The Fire Department shall be notified 48 hours in advance if access to the Fire Department Connection will be restricted.

F. The Contractor shall employ an independent testing agency to survey all electrical systems, outlets and devices prior to and following substantial completion of the work. The Contractor shall be responsible to ensure that all electrical and related life safety systems are restored to the pre-construction operational function prior to start of school.

G. Crack monitoring devices shall be placed on all existing wall cracks 1/16 inch or greater. Monitor daily during sheet pile driving, excavation and drilling, and bring movement of 1/16 inch or greater to the attention of the engineer for evaluation. Crack monitors shall remain throughout the treatment operation phase.

H. The Contractor shall survey water pressure conditions before and after construction. Static water pressures shall be collected at all interior water fixtures. Any fixtures or piping damaged that occurs during construction shall be repaired at the Contractor's expense.

I. The Contractor shall employ an independent agency to video survey the existing sanitary sewer piping below the building before the start of construction, after construction, and again after HWF operations are completed.

1.10 TEMPORARY EROSION AND SEDIMENT CONTROLS

A. The Contractor shall furnish, install, and maintain temporary erosion and sedimentation controls as specified in Section 01575 – Temporary Erosion and Sediment Controls.

B. The Contractor shall remove all soil, mud and residuals from vehicle wheels, tires, fenders, tailgates and other surfaces before exiting to public streets to prevent impacted soil from being tracked or spilled onto public streets. If soil or impacted materials are

tracked onto a public road surface, the Contractor shall clean the road thoroughly at the end of each day or more frequently as directed by the Engineer. Contractor shall have a dedicated street cleaner with a vacuum removal system on the site at all times. This street cleaner shall be operated during work hours when construction traffic is on City streets.

1.12 HAUL ROADS AND ACCESS ROADS

A. The Contractor shall establish site entrance gates at the locations established in the Engineer-approved Technical Execution Plan to provide safe and efficient traffic flow to be used under normal circumstances by all personnel and construction vehicles.

B. The Contractor shall layout, construct, and maintain, subject to approval by the Engineer, on-site temporary haul roads for the efficient transport of excavated materials and backfill.

1.13 TRAFFIC AND TRUCKING PLAN

A. The Contractor shall develop a Traffic and Trucking Plan for inclusion in the Technical Execution Plan that:

1. Maintains emergency services access throughout the Site;
2. Maintains public access to all parts of town that are outside of the active remediation area;
3. Uses traffic and pedestrian traffic controls and signage. Information on the proposed temporary traffic and pedestrian control signal equipment shall be included;
4. Ensures that road closures and detours are posted on signage;
5. Ensures traffic control and public safety;
6. Maintains emergency ingress and egress to public facilities, residences, and businesses.

1.14 PARKING

A. The Contractor shall designate a parking area on BNSF property to accommodate the personal vehicles of Contractor employees, the Engineer, Owner, and visitors. The Contractor employees shall not park their personal vehicles on school property, adjacent to school property, in front of town buildings or businesses at any time. Construction vehicles shall not be allowed in the areas designated for parking personal vehicles.

B. The Contractor shall designate an area of the Site to be used for parking and maintenance of construction vehicles and equipment.

1.15 PROGRESS CLEANING AND WASTE REMOVAL

A. The Contractor shall maintain all Work areas free of waste materials, debris, and rubbish, maintain the Work site in a clean and orderly condition, and collect and remove waste materials, debris, and rubbish from the Work site weekly and dispose off-site.

1.16 STOCKPILE AREAS

A. The Contractor shall establish stockpile areas as indicated on the Plans for coordination of excavation and transportation to approved off-site disposal facilities.

B. Contractor shall use the designated stockpile area in the Railyard as pre-approved by the Engineer. The Contractor shall not stockpile material on School property.

1.17 FIELD OFFICES AND SHEDS

A. General requirements for all sheds and offices shall be as follows:

1. Structurally sound, weather tight, with floors raised above ground, with tie-down straps.
2. Thermal insulation compatible with occupancy and storage requirements.

B. The Contractor shall furnish and maintain a field office for the use of Contractor at the Project site, at a location approved by the Engineer during the entire period of work, and a separate field office for use by the Engineer immediately adjacent to the Contractor's trailer.

1. The Contractor's and Engineer's field offices shall be located on BNSF property in an area designated by BNSF.
2. The Contractor's and Engineer's field offices shall be of a size (minimum 10' x 36'), construction and outfitted in a manner customary to such facilities at similar construction sites.
3. The Contractor's and Engineer's field offices shall be furnished with appropriate fire extinguishers, first aid supplies, furniture, photocopier, and office supplies. The Engineer's field office shall have a meeting table, 8 fold-up chairs for project meetings, drinking water service, a minimum of two desks with lamps, cushioned desk chairs, phones, and a white board (minimum 8 ft long and 4 ft high) along one wall. Four sets of keys for the Engineer's personnel shall be provided to the Engineer. The Contractor shall supply and pay for power and high speed Internet service for all field offices for the duration of the project.
4. At a minimum, the Engineer's field office shall have a printer, scanner and copier, capable of producing/reproducing 8.5 x 11 inch and 11x17 inch documents. The scanner shall be capable of producing Portable Document Format (PDF) files. The equipment can be an all-in-one type unit or separate units, all capable and setup for wireless use. All print cartridges and drinking water shall be supplied by the Contractor. Support services and/or technical assistance necessary to operate or troubleshoot the field office equipment shall be provided by the Contractor.

C. Mobilization shall include office site preparation, Labor & Industry (L&I) electrical inspection costs, power and telephone & internet monthly service costs, access road construction, and maintenance of the site access with 2"- 4" spall rock and fabric.

1. The Contractor's and Engineer's field offices shall be supplied and serviced with appropriate power, phone, fax and high speed internet connections, and sanitary service.

1.19 REMOVAL AND RESTORATION OF UTILITIES, FACILITIES, AND CONTROLS

A. The Contractor shall remove temporary utilities, equipment, construction facilities and materials placed or constructed by Contractor during the work, prior to submitting final Application for Payment.

B. The Contractor shall remove from the Work site all materials, equipment, vehicles, construction facilities, temporary controls, rubbish, debris, and wastes.

C. The Contractor shall dismantle and remove from the Project site, as directed by the Engineer, all temporary fencing provided by Contractor.

1.20 FUEL STORAGE AND DISPENSING

A. The Contractor shall store fuel on site only in approved containers that meet all relevant fire codes.

B. Fueling of construction equipment shall occur only during normal working hours.

C. The Contractor shall not perform fueling operations within 50 feet of storm drains.

D. The Contractor shall construct berms and spill protection and collection devices at all fixed fueling facilities on the site.

E. The Contractor shall take measures to prevent spills during fueling.

F. The Contractor shall provide materials, personnel, and equipment to promptly mitigate any spills caused during vehicle and equipment fueling activities.

G. The Contractor shall not commingle waste materials caused by fueling or vehicle maintenance activities with excavated contaminated soil or with impacted water generated by the work.

H. The Contractor shall be responsible for all costs associated with the disposal of waste materials caused by spills.

I. Contractor shall have adequate spill and fire suppression equipment readily available for proper handling of fuel.

J. Contractor shall not store fuel or perform construction equipment fueling on School Property.

1.21 SECURITY

A. Provide facilities to protect the buildings and Work from unauthorized entry, vandalism, or theft while buildings are being moved, relocated, and held in storage.

B. The construction site shall be closed to the public at all times. Construction site is defined as the temporary facilities and work areas inside partitions, enclosures, and cones and tape.

1.22 SCHOOL FUEL FACILITIES

A. Contractor shall perform leak testing on the School heating oil tank and lines before start of construction and after completion of intrusive construction (excavation, demolition, backfill, compaction, well installation, piping installation, and sheet pile installation). Tank tightness testing and line tightness testing shall be performed in compliance with the applicable provisions of Washington State, Department of Ecology, Underground Storage Tank Regulations, Chapter 173-3600 WAC.

B. Any impacts to the School heating oil tank and lines resulting from construction operations, as determined by leak testing, shall be repaired by the Contractor in compliance with the applicable provisions of Washington State, Department of Ecology, Underground Storage Tank Regulations, Chapter 173-3600 WAC. Tank and line leak testing shall be repeated following any heating oil tank or line repair until successful testing has been achieved.

C. All heating oil tank and line testing shall be performed by an independent tank testing company certified to perform tightness testing in the state of Washington.

D. Contractor shall empty School heating oil tank before initiating intrusive construction. Contractor shall document the quantity of fuel removed and replace an equal quantity upon completion of intrusive construction and successful performance of tank and line leak testing.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used

END OF SECTION 01500

BNSF – Skykomish School HWF Remediation

SECTION 01575

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submittals
B. Performance Requirements
C. Geotextile Fabric Silt Fence
D. Surface Water Run-on/Run-off Control
E. Inspection and Maintenance

1.02 SUBMITTALS

A. The Contractor shall prepare and submit a daily inspection and maintenance log in accordance with Section 01330 – Submittal Procedures. This daily log shall accompany the required daily report and be presented no later than noon of the following day.

1.03 PERFORMANCE REQUIREMENTS

A. The Contractor shall provide a site specific construction SWPPP.

B. Compliance: The Contractor shall be responsible for compliance with Permit conditions, including best management practices as outlined in the SWPPP.

C. The Contractor shall employ the following general procedures, or other procedures as required by the approved Soil Erosion and Sediment Control Plan:

1. Run-On/Run-Off Controls: Contractor shall use ditches, berms, pumps, and other methods necessary to divert and drain off-site surface water away from excavations and other work areas.
2. Sediment Controls: Contractor shall take necessary precautions and implement best management practices to prevent sediment from entering roadways, storm sewers, or catch basins.

D. Contractor shall construct stockpiles in accordance with Section 02110-Excavation and Stockpiling.

E. Street Cleanliness: Where construction vehicle access routes intersect public roads, the Contractor shall take action to prevent the transport of sediment (mud, soil, or dust) onto public streets. The Contractor shall construct haul roads, including tire washes, with necessary controls to prevent sediment transport to public streets. If sediment or mud is transported onto a road surface, the Contractor shall clean the road thoroughly at the time that sediment impacts the roadway. The Contractor shall remove sediment from the roads by vacuum sweeping. Such sweepings shall be transported to the on-site stockpile area. Street washing shall be allowed only after sediment removal and in conjunction with the use of vacuum sweepers. The Contractor shall maintain a fully-operable vacuum street sweeper on the site at all times during the time that transport of sediment occurs. The vacuum street sweeper shall be sized to quickly and efficiently sweep the public streets in the town.

F. Control of Pollutants Other than Sediment:

1. All pollutants that occur on the Project site during construction shall be handled and disposed of in a manner that does not impact stormwater runoff.
2. Fueling Contractor equipment shall be performed at least 50 feet from storm drain inlets and catch basins.
3. Extreme care shall be taken to prevent fuel spills. Spill prevention and clean-up procedures shall be followed during the fueling operation. The Contractor shall notify the Engineer, the local Fire Department, and other authorities in the event of a spill. The Contractor shall be solely responsible for responding to fuel spills, including all costs of removing, decontaminating, and disposing of materials impacted by spills.
4. The Contractor shall provide and maintain absorbent materials, shovels, and containers for proper spill response and clean-up. Clean-up materials and methods shall be consistent with standard, approved methods for the type of fuels, oils, and other materials used.

PART 2 – PRODUCTS

2.01 GEOTEXTILE FABRIC SILT FENCE

A. Silt fence materials and supports shall be heavy-duty and pre-assembled, conforming to the requirements of the Plans and Specifications.

PART 3 – EXECUTION

3.01 SURFACE WATER RUNON/RUNOFF CONTROL

A. All stormwater runoff from within the work areas shall be kept within work areas, and adjoining properties shall be protected from surface drainage caused by the construction operations. Implement temporary measures such as dikes, ditches, curb walls, pipes, sumps, or other approved best management practices as required.

B. The geotextile fabric silt fence shall conform with the following:

1. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid use of joints. When joints are necessary, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and both ends securely fastened to the post.
2. Posts shall be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 12 inches (where physically possible).
3. A trench shall be excavated along the line of posts and upslope from the barrier. The trench shall be constructed to follow the contour.
4. When slit film filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch long, tie wires, or hog rings. The wire shall extend into the trench a minimum of 4 inches and shall not extend more than 36 inches above the original ground surface.
5. Slit film filter fabric shall be wired to the fence, and 20 inches of the fabric shall extend into the trench. The fabric shall not extend more than 36 inches above the original ground surface. Filter fabric shall not be stapled to existing trees. Other types of fabric may be stapled to the fence.
6. When extra-strength monofilament fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other provisions of ‘E’ above

applying. Extra care should be used when joining or overlapping these stiffer fabrics.

7. The Contractor may use properly compacted native material for backfilling. If gravel is used instead, the trench shall be backfilled with ¾-inch minimum diameter washed gravel. Care shall be taken when using gravel to ensure good contact between the fabric and the trench bottom to prevent undercutting.
8. Filter fabric fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized. Retained sediment must be properly removed. Slopes shall be mulched and seeded.

3.02 INSPECTION AND MAINTENANCE

A. Contractor Inspections must be completed by a certified erosion and sediment control lead (CESCL). The CESCL must be certified through an approved erosion and sediment control training program that meets the minimum training standards established by Ecology.

B. The Contractor shall inspect and repair or replace damaged components of temporary erosion and sediment controls daily or more frequently as directed by the Engineer. Inspect immediately after rain or flooding events, and inspect daily during prolonged rain events. Written records shall be kept of weekly reviews of the ESC facilities.

C. The Contractor shall remove sediment deposits and place them in designated stockpile areas. Sediments shall not be allowed to migrate off site. Any sediment that has been in contact with contaminated material shall be incorporated into material to be transported for treatment or disposal.

D. Contractor equipment and vehicles are prohibited from operating outside the right-of-way and easement for construction and shall operate only within the public right-of-way and construction easements.

E. Damage to erosion and sediment control systems caused by construction operations, weather, or negligence shall be repaired immediately at no additional cost to the Owner or the Engineer.

END OF SECTION 01575

SECTION 01580

ENVIRONMENTAL CONTROL

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Dust Control
B. Air Emission and Odor Control
C. Noise Control
D. Puget Sound Clean Air Agency Emission Standards

1.02 DUST CONTROL

A. Dust Control: Dust particles, aerosols, and gaseous by-products from construction activities, and processing and preparation of materials shall be controlled at all times, including weekends, holidays, and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, buildings, and other work areas within or outside the work area free from particulates that would cause the air pollution standards to be exceeded or that would cause a hazard or nuisance. The Contractor shall have sufficient appropriate equipment and experienced personnel available to accomplish these tasks.

B. The Contractor shall provide all labor, materials, and equipment, including water trucks and dust suppressant, needed to limit visible dust generation during on-site excavation and on-site haul and other work activities.

C. The Contractor shall provide dust control measures required by all applicable regulatory requirements that include the following:

1. Wetting agents shall be used as needed.
2. Trucks carrying soil from the excavation area to the stockpile area shall be covered should the Engineer determine that dust is being generated from the load.
3. Truck beds carrying impacted material from the excavation site shall be fully sealed so that no leakage from the trucks occurs. The sediment/soil is expected to be wet – the truck sealing mechanism shall maintain a tight seal against leakage. Note that muck locks on a standard dump truck bed are not considered water tight as defined herein.
4. Soil stockpiles shall be located away from pedestrian areas and completely covered daily when not in use during times when dust is being produced.
5. Regular and continual cleaning of sidewalk and adjacent streets shall be provided.
6. A fully operable and well-maintained vacuum street cleaning truck shall be on the site at all times and shall be operated continually to maintain the adjacent streets and haul streets free of debris whenever the excavation and hauling or railcar load-out operations are under way. Soil or sediments or mud spilled on the streets shall be immediately removed by Contractor.
7. Block out and/or cover HVAC ducts, enclosures, voids, and the like on relocated structures to ensure no dust or fume accumulation.

D. The Contractor shall immediately remove any excess dust which accumulates in or near Site structures as a result of construction activities as determined by the Engineer.

1.03 AIR EMISSION AND ODOR CONTROL

A. Odor and Vapor Suppressant Barrier

1. The Contractor shall completely and securely cover all stockpiles on the Project site with 6-mil polyethylene sheeting as directed by the Engineer at times when odor or dust is being produced, or when precipitation will adversely affect the stockpile.

B. The contractor shall comply with requirements of the *Hot Water Flushing Air, Noise, and Odor Monitoring Plan, Skykomish School, 105 6th Street, Skykomish, Washington* prepared by Elisabeth Black, Certified Industrial Hygienist, EMB Consulting, LLC, January 7, 2015 provided in Appendix A.

1.04 NOISE CONTROL

A. The Contractor shall conduct all Project work in accordance with the Laws and Regulations concerning noise and sound levels.

B. The Engineer will have authority to direct the Contractor to stop Work or modify Work methods or activities as necessary.

C. The following construction site decibel level limits shall be adhered to during work hours for impact type construction equipment:

1. Equivalent Sound Level (Leq) ninety dB(A) continuously;
2. Leq 93 dB(A) for 30 minutes; and
3. Leq 96 dB(A) for 15 minutes.

D. Equipment used on the site must meet the requirements of the Skykomish Municipal Code that specifies a maximum permissible sound of 80 db(A) at the property boundary or 50 feet from the equipment (whichever is greater) for equipment used on construction sites in residential areas with residential receivers.

E. Contractor equipment shall be outfitted with mufflers and other sound-attenuating equipment so that sound levels do not exceed the above limits when measured at a property line or a distance of 50 feet from any vehicle or equipment. Equipment engines shall not be started prior to 7:00 a.m. Monday through Friday, or 9:00 a.m. Saturday or Sunday if weekend work is approved by the Engineer.

F. Truck idling in Town must be minimized when trucks are queuing for loading or dumping.

G. The contractor shall comply with requirements of *Addendum 3 To The 2010 Compliance Monitoring Plan Update*, prepared by Farallon, January 5, 2015 (attached).

1.05 PUGET SOUND CLEAN AIR AGENCY EMISSION STANDARDS

A. The Contractor shall be responsible for implementing specific provisions of the PSCAA Air Quality Control Regulations that include the following:

1. All persons responsible for any operation, process, handling, transportation, or storage at a facility that may result in fugitive dust shall take all reasonable precautions to prevent such dust from becoming airborne. Some reasonable precautions that could be taken to prevent dust from becoming airborne include but are not limited to the following:

    a. Use of water or chemicals – where possible, control equipment and enclosures for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land;
    b. Application of asphalt, water, or suitable chemicals on dirt roads, materials, stockpiles, and other surfaces that can give rise to airborne dusts;
    c. Treating construction sites with water or chemical stabilizers, reducing vehicle speeds, and cleaning vehicle wheels and undercarriages before exiting site to prevent the track-out of mud or dirt onto paved public roadways; and
    d. Covering or wetting truck loads or allowing adequate freeboard to prevent spillage or the escape of dust-bearing materials.

2. The project shall follow guidelines set out by the Association of General Contractors of Washington (AGCW) in the brochure Guide to Handling Fugitive Dust from Construction Projects to reduce construction dust.

3. Construction machinery engines shall be maintained in good mechanical condition to minimize exhaust emissions.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION 01580

BNSF – Skykomish School HWF Remediation

SECTION 01722

CONSTRUCTION SURVEYING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submittals
B. Examination
C. Survey Reference Points
D. Survey Requirements

1.02 SUBMITTALS

A. Submit field notes, computations, data logger information, and all other survey records for the purposes of layout of the Work to the Engineer on a weekly basis. The data and records shall include, but not be limited to, all subsurface conduits, at-grade and above-grade utility features, above-grade and below-grade structures, storm sewer, sanitary sewer, and water supply systems layout; utility crossing layout; remediation areas before and after excavation plan view and cross-sections with volume calculation; fence control and layout; street light base layout, elevations and layouts of all existing and newly installed utilities, pavement marking stop-bar and crosswalk layout, right-of-ways; property corners; to the Engineer on a weekly basis or as the control for the work as accomplished.

B. Submit the Record Plans, prepared and stamped by a surveyor licensed in the State of Washington, to the Engineer at the completion of the Project.

C. Provide survey data electronically in AutoCAD 2007, or later version, and in tabulated formats. All control points shall have all horizontal and vertical data and reference point name as appropriate. The Engineer will provide data formatting requirements.

D. The Contractor shall maintain all survey data and survey drawings as Record Documents as specified in the Section 01325 – Progress Schedules and Reports and submit Record Documents as specified.

E. The Contractor may utilize survey-grade Geographic Positioning System (GPS) to control construction in the work areas. Should this be the case, the Contractor must submit the equipment type, experience using this equipment, the qualifications of the proposed equipment operators, and demonstrate the accuracy of such equipment in Skykomish to the satisfaction of the Engineer.

1.03 EXAMINATION

A. Verify locations of survey controls and baseline prior to starting project work.

B. Notify the Engineer promptly of any discrepancies found.

1.04 SURVEY REFERENCE POINTS

A. The Contractor's surveyor shall establish temporary benchmark(s) and horizontal control for the project work using the baseline control datum referenced on the Plans.

B. Locate and protect survey control and reference points, including right-of-way and property corners, during construction.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 SURVEY REQUIREMENTS

A. The Contractor shall provide, coordinate, and schedule a professional surveyor licensed in the State of Washington, in order to provide construction support and establish and maintain control lines, grades, slopes, cross-sections, re-establish section corners and right-of-way and property corners lost in the construction activity. The Contractor shall bear full responsibility for detailed dimensions, elevations, slopes, temporary control points, record plans measured from the baseline control.

B. The Engineer will provide the Surveyor with an electronic survey base map that is available for the project site at the start of Project Work for informational purposes only. The Contractor's Surveyor is entirely responsible for verifying the information in the base map.

C. The surveyor shall be trained in accordance with OSHA/WISHA standards and other health and safety training requirements, including BNSF's contractor orientation (http://www.contractororientation.com/) and the Department of Homeland Security required training for work on the railyard (http://www.e-railsafe.com/), in these Specifications to enter exclusion zone work areas. The Contractor shall provide the Engineer with copies of these training certifications for the surveying personnel prior to commencing project work.

D. The Contractor shall conduct an initial survey and verify Project baseline control, site boundaries, individual parcel boundaries within all the Work areas, limits of excavation as shown on the Plans.

E. All survey work for the Project shall be conducted by a land surveyor licensed in the State of Washington and shall utilize recognized engineering survey standard practices appropriate for roadway and remedial site construction in accordance with these Plans, Specifications, and Specifications addenda.

F. The Contractor shall preserve project survey staking during the various construction operations and shall be fully responsible for maintenance and replacement of survey control staking that is destroyed or lost regardless of the reason for loss. Any replacement staking shall be generated from the same datum used by the original survey staking.

G. The Contractor is solely responsible for checking and verifying the property/parcel boundaries using the survey base map provided by the Engineer and/or any other means. If any discrepancies are noted between the survey base map and the site conditions, the Contractor shall inform the Engineer and resolve the issue before continuing with the work. The Contractor shall inform the Engineer of any encroachment issues prior to relocating the structures to their original locations.

H. During the course of excavation work, the Contractor shall record final elevation of excavation floors once the excavation is complete in each area. This may require surveying the excavation floor from a boat in standing water.

I. The Contractor shall assist the Engineer in laying out a 20 ft by 20 ft sampling grid at the estimated limits of excavation. The Contractor shall survey the corners of the grids by either a licensed surveyor or by survey-grade GPS survey (with prior approval of the Engineer) and mark the perimeter corners with stakes, and mark the interior corners with construction spray paint. All grids will be designated with an alphanumeric designator.

J. Upon completion of excavation in an area (determined by the Contractor demonstrating that they have achieved the required excavation depth within the grid), the Engineer, with the cooperation and assistance of the Contractor, will collect confirmation samples from floors and sidewalls of the excavation and establish sample locations on the ground with flags for sample locations which are not below standing water. The Contractor shall then survey elevations of these sample locations indicated by the flags prior to starting the backfill operation of the remedial excavation. The Contractor shall preserve the flags until the surveying of the sample locations is completed. In areas with standing water, the Contractor shall survey the final excavation bottom and sides (once approval has been given by the Engineer to backfill) using standard surveying equipment or survey-grade GPS equipment. The Contractor can use GPS for survey control on the site only after demonstrating the accuracy and the ability to use such equipment on the site to the Engineer.

K. During the course of backfilling and site restoration work, Contractor personnel shall establish and record elevations to document that site restoration is complete in accordance with documented finish grade contours.

L. The Contractor shall promptly replace and report to the Engineer the loss or destruction of any original mainline reference point or relocation required because of changes in grades or other construction issues. The Contractor shall replace dislocated reference points based on original survey control. The Contractor shall make no changes without prior written notice to the Engineer.

M. The layout shall be executed in conformance with the lines and grades shown on the Plans unless otherwise approved by the Engineer.

N. The Contractor shall establish survey construction control staking for all site preparation and site restoration items of the project work.

O. The Engineer shall have access to the Project area for the purpose of verifying the Contractor's survey control staking for the remedial excavation and other work. Should

it become apparent the Contractor has over-excavated a certain area, work in that area shall be temporarily discontinued at no extra cost to the Owner or the Engineer.

P. Provide the Engineer with pre-excavation survey cross-section map prior to beginning the actual excavation. When the Engineer determines the remedial excavation is complete, the Contractor's surveyor will measure and prepare a second cross-section map showing the final elevations of the remedial excavation site. The licensed surveyor will then determine the volume of the excavation on which payment for the excavation will be based. The Contractor shall provide the Engineer with copies (both electronically in Adobe pdf and AutoCAD 2007) of the pre-excavation and post-excavation survey so the Engineer may review and cross-check the cross-sections and computation. The survey cross-section map shall be prepared by a Washington State licensed professional surveyor retained by the Contractor. The contractor's surveyor shall establish and maintain temporary horizontal and vertical control for the work.

Q. The Contractor supplied survey construction support shall consist of providing control for remedial excavation, documenting site features, replacement of lost property corners resulting from excavation and backfilling, as-built/record plans, and other work supporting the successful completion of this Project.

R. Provide the As-Built/Record Drawings and topographic survey map to Engineer for review and approval. The site survey As-Built and topographic map shall be prepared and stamped by the Contractor's Registered Land Surveyor, and shall be supplied in both hard copy and electronic copy (Adobe pdf and AutoCAD 2007).

S. The Contractor shall be solely responsible for any encroachment issues that may be identified after the final restoration.

T. At the end of construction, the Contractor's surveyor shall prepare Record Plans, showing horizontal and vertical limits of pre- and post-remedial excavation; any changes in locations of storm drainage, final grades, and elevations and other significant site feature at variance from the Plan. Survey points shall be within 0.1 foot of accuracy. Provide topographic map with grade contours at 1-ft intervals. The Contractor shall submit the Record Plans with the final billing request. Record Plans shall include red-lined plans of changes in the original plan, cross-sections, and profiles as necessary to accurately represent added work and actual locations.

END OF SECTION 01722

SECTION 01730

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Submittals
C. Quality Assurance

1.02 SUMMARY

D. This Section specifies administrative and procedural requirements for cutting and patching.

E. Refer to other sections for specific requirements and limitations applicable to cutting and patching individual parts of the work.

1. Requirements of this section apply to all work, including mechanical and electrical installations. Refer to Division 15 and 16 sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installation.

F. Demolition of selected portions of the building for alterations is included in Section 02220: “Demolition."

1.03 SUBMITTALS

G. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building’s appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform work.
4. Indicate dates when cutting and patching is to be performed.
5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Approval by the Architect to proceed with cutting and patching does not waive the Architect’s right to later require complete removal and replacement of a part of the work found to be unsatisfactory.

1.04 QUALITY ASSURANCE

H. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Where cutting and patching involves addition of reinforcement to structural elements, submit a detailed request to the Architect at least seven (7) days prior to initiating work to allow for review of the request by the structural engineering consultant. Include in the request details and engineering calculations to show how reinforcement is integrated with the original structure.
2. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

a. Shoring, bracing, and sheeting
b. Primary operational systems and equipment
c. Air or smoke barriers
d. Water, moisture, or vapor barriers
e. Membranes and flashings
f. Fire protection systems
g. Noise and vibration control elements and systems
h. Control systems
i. Communication systems
j. Electrical wiring systems

I. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually unsatisfactory manner.

1. If possible retain the original installer or fabricator to cut and patch the following categories of exposed work, or if not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:

a. Processed concrete finishes
b. Ornamental metal
c. Preformed metal panels
d. Window wall system
e. Stucco and ornamental plaster
f. Acoustical ceilings
g. Carpeting
h. Wall covering
i. HVAC enclosures, cabinets or covers

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.01 INSPECTION

A. Before cutting existing surfaces, examine surface to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the project that might be exposed during cutting and patching operations.

D. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

E. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

F. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

G. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
4. Comply with requirements of applicable sections of Division-2 where cutting and patching requires excavating and backfilling.

5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

H. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a smooth painted surface, after the patched area has receive prior and second coat, extend final paint coat over the entire unbroken surface containing the patch from floor to ceiling and to the nearest corner in both horizontal directions.
4. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

I. Plaster Installation: Comply with manufacturer's instructions and install thickness and coats as indicated.

1. Unless otherwise indicated provide 3-coat work.
2. Finish gypsum plaster with smooth-trawled finish. Sand lightly to remove trowel marks and arises.
3. Cut, patch, point-up and repair plaster to accommodate other construction and to restore cracks, dents and imperfections.

3.04 CLEANING

J. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 01770

CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Submittals
B. Final Cleanup – Project Site
C. Restoration
D. Contract Closeout Procedure

1.02 SUBMITTALS

A. The Contractor shall submit the following items in accordance with Section 01330 – Submittal Procedures:

1. The Contractor shall submit a written request to the Engineer for a Final Inspection after determining that all aspects of the Project are complete.
2. The Contractor shall submit the Project record documents described in Section 01325 – Progress Schedules and Reports.
3. The Contractor shall submit a final Application for Payment, less retainage.
4. The Contractor shall submit a Closeout Report after formal Final Acceptance of the Project by the Engineer. The Closeout Report shall consist of the Record Drawings/As-Built survey of the Project site and all the material weight tickets. The Contractor shall submit the Closeout Report within two weeks of the Final Acceptance of the Project by the Engineer.
5. The Contractor shall submit an Application for Payment of Retainage accompanied by Contractor's Affidavit of Release of Liens and Contractor Affidavit of Payment of Debts and Claims.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 FINAL CLEAN UP – PROJECT SITE

A. Upon completion of the Project work and prior to the requested final inspection, the Contractor shall clean and dress the entire Project of all rubbish, surplus, and discarded materials, temporary facilities and controls, equipment, and debris. The entire Project site shall be dressed in a clean and neat condition for the Final Inspection by the Engineer for the turn-over.

3.02 RESTORATION

A. Prior to initiating the contract closeout procedure the Contractor must complete all site restoration including, but not limited to, restoration as outlined in Section 02920 Sod and Hydroseed.

3.03 CONTRACT CLOSEOUT PROCEDURE

A. The Contract closeout procedure shall take place in the following order:

1. The Engineer will perform the Final Inspection after receiving the written request from the Contractor.
2. The Engineer will prepare a Punch-List of Contract items for needed corrective action by the Contractor.
3. The Contractor shall correct all Punch-List items expeditiously and satisfactorily.
4. The Contractor shall submit the Final Application for Payment to the Owner and Engineer and therein identify the total adjusted Contract price, previous payments, sales tax, and amount remaining adjusted for retainage.
5. The Contractor shall submit the Application for Payment of Retainage along with the required, supporting affidavits.

END OF SECTION 01770

BNSF – Skykomish School HWF Remediation

SECTION 01810

COMMISSIONING

PART 1 – GENERAL

1.01 SUMMARY

A. This section shall form the basis of the commissioning process and procedures. The commissioning procedures may be modified to suit field conditions and actual manufacturer's equipment, incorporate test data and procedure results, and provide detailed scheduling for all commissioning tasks.

B. Commissioning is a systematic process of verifying that the systems perform interactively according to the construction documents and the site's operational needs. The commissioning process shall encompass and coordinate the documentation, equipment startup, calibration, testing and balancing.

C. Commissioning during the construction and early operational phases is intended to achieve the following specific objectives:

1. Verify that the applicable equipment and systems are installed in accordance with the contact documents and according to the manufacturer's recommendations.

2. Verify and document proper integrated performance of equipment and systems.

3. Facilitate any necessary modifications in the system based on observations of site conditions that are different than expected during installation.

4. Verify that Operations & Maintenance documentation is complete.

5. Verify that all components requiring servicing can be accessed and serviced with minimal disruption to nearby components including ducts, piping, cabling or wiring.

6. Document the successful achievement of the commissioning objectives listed above.

D. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

E. This commissioning specification is intended to be coordinated with installation, start-up, and operational services that are specified in other process and equipment specifications. The Contractor shall coordinate the work required by other individual specifications with the commissioning services requirements specified herein.

1.02 SUBMITTALS

A. The following shall be submitted after commissioning is complete.

1. Inspection and Test Plans (ITPs)

2. Functional Performance Testing (FPT) documentation

1.03 COMMISSIONING PROCESS

A. The Contractor is responsible for identifying key commissioning milestones as part of the construction schedule. The scope of these activities is outlined in this section. Below is a summary describing key sequential tasks for the commissioning process.

1. Submission of all manufactures Product Data (spec sheets) for installed equipment
2. Initial Commissioning Meeting
3. Completion of ITPs
4. Start-up
5. Functional Performance Testing

B. Commissioning Coordinator

The Commissioning Coordinator (CC) will be designated by the Contractor. They will be onsite during all commissioning activities, sign commissioning related submittals, and provide training to site operators at the end of the commissioning phase.

PART 2 – TESTING, ADJUSTING, AND BALANCING PROCEDURES

A. The Initial Commissioning Meeting shall include the CC, commissioning team members, and a representative of the Owner or Engineer. The purpose of the meeting is to review the schedule, scope, tasks, responsibilities, and deliverables.

B. Inspection and Test Plans

The purpose of completing the ITPs is to verify that equipment is ready for functional testing. It serves as a final check over the manufacturer's recommended installation instructions and that field conditions are suitable for operation. ITPs focus on individual components.

C. Start-up

The initial operation or "start-up" of equipment and/or systems is a time for de-bugging. A range of operating conditions must be simulated to check system controls and equipment capabilities. ITPs must be completed before equipment is put into operation.

D. Functional Performance Test

The FPT is a dynamic test of the complete system (not just components) across a range of operating conditions. The purpose is to monitor and document the performance of the system and ensure that the components, controls, and communications are working together as expected.

2.01. PHASES

Because the construction schedule is spread over multiple seasons in order to accommodate the yearly school schedule, commissioning will be broken into two phases. The first Phase I commissioning will encompass the civil work and instrumentation that is installed during the first construction phase. The second Phase II commission involved the completed system.

Across all phases of commissioning, the manufacturer's installation procedures, start-up procedures, field quality control and testing, and on-site storage requirements must be followed.

A. Phase I – Preliminary Commissioning

In coordination with the initial phase of construction, the first phase of commissioning will include the process piping and instrumentation that is installed below grade and below/within the school. Because neither the HWF, CWF, and SVE systems will be completed, no FPT will be done during Phase I. But ITPs for all installed equipment will be completed. Components that are expected to be included in Phase I are:

1. Injection wells, SVE wells, and associated vaults or covers

2. Below grade valves, flow meters, and pumps

3. Pressure sensors, temperature/level elements, PIDs, and associated controls

B. Phase II – Operational Commissioning

The second commissioning phase will include the remaining components and the completed systems. ITPs will be completed after the last components are installed, then the FPT will be done over the complete water flushing and SVE systems.

2.02. DOCUMENTS

A. ITPs

The following ITPs are provided to aid in the planning of the commissioning activities. They should be reviewed at the Initial Commissioning Meeting and may require modification in order to cover any changes that come up during construction, or to cover more specific details that will become known after equipment is procured.

The Contractor is responsible for tracking product orders, manufacturing and factory inspections (if necessary), inspections upon delivery, and inspections during installation. The Contractor is responsible for internal "punch lists" throughout installation and commissioning. These ITPs are provided for the commissioning phase only.

2.03. PRODUCTS

A. PID

A photoionization detector (PID) will be required to be onsite and calibrated at all times during commissioning.

PART 3 – SYSTEM PERFORMANCE

3.01. SEQUENCING

A. The following sequence is provided for planning purposes and should be modified as necessary to meet construction, commissioning, and operation requirements.

1. Complete Phase I ITPs
2. Winterize partially completed system
3. Complete Phase II ITPs
4. Start-up (SVE system first, then flush system)
5. Complete FPT

3.02. START-UP CONSIDERATIONS

All start-up and FPT operations will be witnessed by the Engineer's representative in order to facilitate the testing, adjusting, and balancing procedures that will require the Engineers input.

The SVE system must be operational prior to commissioning the hot water flush system. Commissioning of the SVE must take place before any water (heated or otherwise) is injected into the injection wells.

After the Phase I ITPs are completed, the levels, pressures, and temperatures will be monitored weekly in order to obtain "baseline" data. After the Phase II ITPs are complete, the SVE blowers will be started and balanced before startup of the water flushing system begins. It is expected to take approximately one week to verify the performance of the SVE system. This timeline and procedure will be determined during the commissioning period, in coordination with the Owner and Engineer.

Initial water flushing will not involve heated water, but will be done by bypassing the boiler and chiller. This process will be tested and balanced as necessary during startup to obtain baseline flow rates and water levels, and balance the flow between injection wells and extraction sumps. Daily monitoring of the process and communication with the Engineer during this phase is crucial to properly balance the system.

Once hot water flushing commences, the Contractor can complete the FPT documentation and begin operating the facility under normal conditions (see Section 01830 Operation and Maintenance).

Startup recommendations are presented more thoroughly within the FPT documents.

3.03. DOCUMENTS

A. After the construction is finished, and the remaining ITPs are completed, the FPT can then begin and be documented.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 01830

OPERATION AND MAINTENANCE

PART 1 – GENERAL

1.01 SUMMARY

A. This Section includes:

1. General process narratives describing operation and preventative maintenance of the facility after commissioning.

2. Operation and maintenance requirements for periods of HWF, CWF, SVE operation, and periods of system shutdown.

1.02 QUALITY ASSURANCE

A. Coordinate with section 01810 (Commissioning) in order to review Operations and Maintenance recommendations for all systems during commissioning.

PART 2 – PRODUCTS

2.01 MONITORING EQUIPMENT

All monitoring equipment is required to be onsite at all times during operational modes. Equipment shall be calibrated in accordance to manufacturer's guidelines and schedules.

A. PID

A photoionization detector (PID) will be used to measure the VOCs in the extracted soil vapors and throughout the SVE treatment system.

B. Oil/Water Interface Probe

This probe will be used to routinely measure the depth to product, water, and total well depth.

C. Handheld Infrared Thermometer

The handheld infrared thermometer will be used to measure temperatures of piping at various locations and measure school building floor temperatures.

PART 3 – EXECUTION

3.01 OPERATING AND MAINTENANCE

Because of the unique nature of this project, the system will be operated over a range of specific operating conditions. Optimal ranges of operating parameters will not be known until after the equipment is installed and the commissioning phases are completed. Specific operating procedures will be determined during the commissioning process. Narratives of how the different systems are expected to operate are provided below.

A. Hot Water Flush

The hot water flush (HWF) system will operate only when school is not in session during the summer months (primarily June-July).

When the system is in the HWF mode, extracted groundwater is treated and (re)heated before being injected into either some or all of the injection wells. The main components of the system include the recovery trench (with 10 sumps and associated pumps and oil skimmers), the water treatment system, boiler, and 25 injection wells. The water is routed through a system of primarily carbon steel pipes, well vaults, and valves. The total flow rate in this system is expected to be between 30 and 60 gpm. Groundwater temperatures could be between the ambient groundwater temperature (53 ºF) and up to 130 ºF.

The speed of the extraction pumps will be balanced using variable frequency drives (VFDs). The purpose of the extraction pumps is to keep enough water in the recovery trench that the oil on the water surface can contact the oil skimmers. The pumping should keep the hydraulic gradient across the site sloping toward the extraction trench in order to keep the water and oil moving into the trench (and therefore the skimmers) so that oil can be recovered.

The injection wells are grouped into zones. Each zone, and each well, can be balanced using valves to modulate flow. Each well has a flowmeter installed on the line in order to aid in the balancing. Ground water level information will be used to adjust individual injection well flow rates so the desired hydraulic gradient on the site can be achieved.

Oil will be periodically removed from each skimmer's collection tank. Levels in the tanks are indicated by alarms, and oil removal will be scheduled as necessary.

The temperature of the injected hot water will be regulated at the boiler, and is expected to be between 140 and 160 ºF. The flush water is heated in order to decrease the viscosity of the oil in the soil, and therefore encourage it to move towards the recovery trench.

Full-time (40-hours per week) operator attendance is required during HWF operations. In addition, weekend and after-hours Contractor response times of less than 4 hours shall be provided. Operators shall be certified waste water treatment operators with boiler operational experience or certification by the State of Washington.

Remote monitoring of the system can be conducted using the HMI interface, and limited shutdown and process control will be available to the operator. Data from the system will be uploaded to a central repository determined by BNSF and their consultants.

B. Cold Water Flush

Prior to the start of school, the floor of the school will be returned to normal seasonal temperatures, to be not more than 80^{o} Fahrenheit, and may involve the use of carpets and other floor insulation. Subsurface cooling and cold water flushing (CWF) will commence a number of weeks prior to the start of school to attain the requisite floor temperatures.

When the system is in CWF mode, it is operated in much the same way as HWF mode, except the boiler is not operated and cold water is injected rather than hot water. This will facilitate cooling of the surrounding groundwater, soil, and buildings. After groundwater is extracted and treated, it may be passed through a chiller rather than a boiler, in order to decrease the temperature (to between 60 and 70 ºF).

If a significant cooling effect isn't required (winter and spring operations), the extracted groundwater can simply bypass both the chiller and the boiler, and be injected at a slightly cooler temperature. The chiller may be demobilized for periods when refrigerating treated water injection is not required.

C. SVE System

The soil vapor extraction (SVE) system will operate whenever HWF and CWF are active. In addition, the SVE system will be operated during when both systems are shut down to maintain a slight vacuum beneath the school floor slab. The SVE system may be shut down during periods of high groundwater events that can occur during the winter and spring.

The SVE system is designed to capture (and treat) soil vapor potentially containing volatile organic compounds from underneath the School. The main components of the system are 6 vertical SVE wells and 1 horizontal SVE well (slotted cPVC), condensate sumps, moisture knock-out tank, blower, heater exchanger, GAC vessels, control valves, sample ports, pressure gauges, flow meters, and temperature indicators, and associated transmitters.

Pressure sensors below and within the building will monitor atmospheric and soil vapor pressure in order to balance the SVE system to maintain a lower pressure below the building than within it. This will ensure that vapors are not migrating up into the building, but instead being pulled into the SVE system and treated. Air inlet wells are located outside of the building in order to provide the proper amount of air movement.

The GAC carbon vessels are design to be operated in a lead-lag manner as two vessels in series. Sample ports before, between, and after the GAC vessels allow consistent monitoring of vapor characteristics and performance of the treatment system (see section E below).

D. Sensor Monitoring (Monitoring during periods when HWF, CWF, and SVE are not operating)

Periods of time will occur when the HWF, CWF, and SVE systems are not operating. These will include the period following subsurface infrastructure installation (summer 2015) and during periods of extreme high groundwater levels (winter/spring). During these periods subsurface water level sensors, groundwater temperatures, sub-slab to indoor air pressure differentials, and indoor air PID readings will be monitored remotely.

The Contractor shall maintain the treatment system to provide for continuous remote sensor monitoring during all system operating and non-operating modes.

E. Operating Schedule

The HWF system will be operated in accordance with the following schedule. Dates are denoted as estimated where dependent upon system performance and School calendar.

HWF Infrastructure Construction – June 17 through August 21, 2015.

Subsurface Condition Monitoring – August 21, 2015 through system commissioning. Estimated to be June 17 – June 23, 2016.

Treatment System Mobilization, Setup, and Testing – Estimated to be April 1 through June 17, 2016 (Noise generating activities cannot be performed, and access to school property is not allowed, when school is in session).

CWF Operations Testing – June 17 through June 23, 2016.

HWF Operations – June 23 through August 21, 2016 (Estimated).

CWF Operations with active chiller operation – Estimated to be August 21, 2016 (Estimated) through September 15, 2016 (Estimated).

CWF Operations without active chiller operation – Estimated to be September 15, 2016 (Estimated) through June 17, 2017 (Estimated).

Beginning in June of 2017 the HWF and CWF (with and without chiller operation) are repeated until it is determined treatment can be terminated.

F. Contractor Operating Requirements

HWF Operation

The Contractor shall provide the required manpower to operate the HWF system. At a minimum the Contractor shall provide one full-time (40-hours per week) onsite operator during periods of HWF. In addition, the Contractor shall provide weekend and after-hours operator response times as defined in Paragraph H. Operators shall be certified waste water treatment operators with boiler operational experience or certification by the State of Washington.

CWF Operation

The Contractor shall provide the required manpower to operate the CWF system. At a minimum this will require onsite system maintenance and monitoring for one 8-hour day per week. In addition, the Contractor shall provide weekend and after-hours operator response times as defined in Paragraph H. Operators shall be certified waste water treatment operators.

SVE Operation

The Contractor shall provide the required manpower to operate the SVE system during periods of CWF and HWF shutdown. At a minimum this will require onsite system maintenance and monitoring for one 4-hour day per week. In addition, the Contractor shall provide weekend and after-hours operator response times as defined in Paragraph H.

Sensor Monitoring

The Contractor shall provide the required manpower to maintain equipment to provide for treatment system sensor monitoring during periods when all systems are shutdown or not operational. At a minimum this will require onsite system maintenance and monitoring for one 4-hour day every 2 weeks. In addition, the Contractor shall provide weekend and after-hours operator response times as defined in Paragraph H.

G. Inspection and Maintenance Requirements

The Contractor shall provide all manpower, tools, spare parts, and equipment as required to maintain treatment system operation. All equipment shall be operated and maintained in accordance with the manufacturers' recommendations. At a minimum, the Contractor shall provide for component inspections, monitoring, and maintenance as defined in this section. Additional inspections, monitoring, and maintenance shall be provided as required to troubleshoot any operational issues as they arise.

HWF Operations

During operation, the regular inspections will include:

1. Injection wells – Daily
    a. Valve box lid security
    b. Insulation integrity
    c. Flowmeter function
    d. Valve operability and leaks around packing and connections
2. Extraction vaults - Daily
    a. Vault lid security
    b. Flowmeter function
    c. Valve operability and leaks around packing and connections
    d. Skimmer function and oil tank level (alarm test)
    e. Pump function and vibration
    f. Measure depth to product (DTP)
    g. Measure depth to water (DTW)
    h. Measure total depth (TD)
3. SVE wells and Instrumentation – Daily
    a. Cover security
    b. Measure pressure at slab ports (data log function).
4. SVE Treatment – Daily
    a. Record flow meter reading (data log function)
    b. Record PID readings at sample ports around GAC vessels

c. Record temperature and pressures\

5. Water Treatment – Daily
    a. Review flow, temperature, and pressure data for incongruities
    b. Check hose connections for leaks or signs of wear

CWF Operations

During operation, the regular inspections will include:

1. Injection wells – Monthly
    a. Valve box lid security
    b. Insulation integrity
    c. Flowmeter function
    d. Valve operability and leaks around packing and connections
2. Extraction vaults - Weekly
    a. Vault lid security
    b. Flowmeter function
    c. Valve operability and leaks around packing and connections
    d. Skimmer function and oil tank level (alarm test)
    e. Pump function and vibration
    f. Measure depth to product (DTP)
    g. Measure depth to water (DTW)
    h. Measure total depth (TD)
3. SVE wells and Instrumentation – Weekly
    a. Cover security
    b. Test 4-20 signal from transmitters (calibrate if needed)
    c. Measure pressure at slab ports (data log function).
4. SVE Treatment – Weekly
    a. Record flow meter reading (data log function)
    b. Record PID readings at sample ports around GAC vessels
    c. Record temperature and pressures
5. Water Treatment – Weekly
    a. Review flow, temperature, and pressure data for incongruities
    b. Check hose connections for leaks or signs of wear

SVE Only Operations

During operation, the regular inspections will include:

1. SVE wells and Instrumentation – Weekly
    a. Cover security
    b. Test 4-20 signal from transmitters (calibrate if needed)
    c. Measure pressure at slab ports (data log function).
2. SVE Treatment – weekly
    a. Record flow meter reading (data log function)
    b. Record PID readings at sample ports around GAC vessels
    c. Record temperature and pressures

Sensor Monitoring

Regular inspections will include:

1. Biweekly inspections of sensor locations.
    a. Valve box lid security
    b. Functional integrity (note that sensor failure will result in an electronic notification through the WIFI LAN system)
    c. Biweekly download of groundwater/level sensors located outside of the school building

H. System Upset Response Time

The HWF, CWF, and SVE system operations will be remotely monitored. When system upsets occur, including equipment failure, component operation out of normal operating ranges, high and low level alarms, the Contractor shall mobilize the appropriate personnel, tools, and equipment to respond, rectify the issue, and restore normal operating conditions. Required response times for specific system issues include:

4-hour response time issues – The Contractor shall provide personnel on site to address the following system issues within 4 hours of notification by remote alarm:

Conditions impacting the School while School is in session (noise, odors, system alarms)

Complaints from the community regarding other operational issues.

24-hour response time issues – The Contractor shall provide personnel on site to address the following system issues within 24 hours of notification by remote alarm:

SVE system operation failure

SVE low pressure alarm

System faults during either cold water or hot water flushing, including boiler/chiller faults.

Other conditions not correctible by HMI remote operational control.

I. Winterization Requirements

The SVE and CWF systems will operate during the winter. This will require winterization of these systems.

Winterization shall include installing insulation blankets on the GAC vessels, draining of the air/air heat exchanger, and installing insulation and heat trace on any ducting and piping outside of the system enclosure.

The Contractor shall provide adequate snow removal around the equipment and GAC vessels to provide sufficient access for operation and maintenance and prevent damage.

Due to the lower winter temperatures, an increased volume of condensate is expected. Condensate will collect in the air/water separator prior to the blower and will be removed as required to permit continued system operation.

3.02 PAYMENT

Payment for treatment system operation will be based on the duration of operation as measured in days and described in Section 01275. Payment will be based on full days operated. No payment will be made for a day of operation when the treatment system is shut down for full days or partial days for any reason except for system shutdowns required for routine maintenance as defined in the operating and maintenance manual developed by the Contractor and full or partial shutdowns resulting from high water.

The Contractor will be paid for HWF Operation days when the HWF system is operational and the Engineer has directed a temporary shutdown of HWF with continued CWF. This will likely occur to modulate subsurface temperatures within a desired operational range.

The Contractor will be paid for CWF Operation – With Chiller days when the chiller system is operational and the Engineer has directed a temporary shutdown of the chiller operation with continued CWF. This will also occur to modulate the subsurface temperatures within a desired operational range.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02055

TOPSOIL

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Submittals
C. Project Conditions
D. Topsoil
E. Source Quality Control
F. Topsoil Type A Placement

1.02 SUMMARY

A. This Section includes providing, placing, and grading topsoil in the work areas identified on the Plans.

1.03 SUBMITTALS

A. The Contractor shall submit, in accordance with procedures of Section 01330 – Submittal Procedures, results of recent sieve analysis of samples of the topsoil proposed for this project as specified herein. A supplier ticket with date, quantity, and truck number shall be provided for each load of topsoil delivered and placed at the work site.

1.04 PROJECT CONDITIONS

A. Materials to be furnished: Topsoil, as specified herein, shall be loaded, furnished, transported to the work site, and placed and graded by the Contractor.

B. Scope of Soil Materials Work: This work includes furnishing, transporting, placing and grading topsoil to the work site and therein incorporated into the Project as shown on the Plans and Specifications.

PART 2 – PRODUCTS

2.01 TOPSOIL

A. Imported topsoil shall be a gravelly silt loam to silt loam, mixed with an organic amendment comprised of a well-decomposed, humus-like material derived from the decomposition of grass clippings, leaves, branches, wood, or other natural organic materials.

B. Topsoil shall have an organic content of 15% ± 5%.

C. The organic amendment shall be produced at a permitted solid waste composting facility.

D. The topsoil and organic amendment mixture shall be free of debris and rocks larger than two (2) inches. Gravel content shall not exceed 5%.

E. Plant topsoil shall not be used when frozen or in a muddy, non-friable condition.

F. Topsoil shall be evenly spread over the specified areas to the depth shown in the Plans or as otherwise ordered by the Engineer. After the topsoil has been spread, all large clods, hard lumps, and rocks 2 inches in diameter and larger, and litter shall be raked up, removed, and disposed of by the contractor.

G. Topsoil shall not be placed when the ground or topsoil is frozen, excessively wet, or in the opinion of the Engineer, in a condition detrimental to the work.

H. The topsoil shall pass a standard cress test for seed germination (90% germination compared to standard). Alternatively, compost shall score a number 5 or above on the Solvita Compost Maturity Test.

I. The topsoil shall be certified by the Environmental Protection Agency's Process to Further Reduce Pathogens (PFRP) guideline for hot composting.

J. The Contractor shall provide documentation to the Engineer from a certified laboratory and from a landscape architect that verifies the Topsoil meets the above criteria.

TABLE OF REQUIRED TOPSOIL PROPERTIES

Parameter	Requirements
Sieve Analysis	Screened using sieve no finer than 7/16" and no greater than ¾"
pH	5.5-7.5
Electrical Conductivity	< 3.0 mhos/cm
Carbon to Nitrogen Ratio	< 15:1
Process to Further Reduce Pathogens Certified for Hot Composting at Compost Facility as outlined in WAC 173-350-220	Yes
Manufactured Inerts	< 1 percent
Sharps	0
Arsenic	< 20 mg/kg
Cadmium	< 10 mg/kg
Copper	< 750 mg/kg
Lead	< 150 mg/kg
Mercury	< 8 mg/kg
Molybdenum[1]	< 9 mg/kg
Nickel	< 210 mg/kg
Selenium[1]	< 18 mg/kg
Zinc	< 1,400 mg/kg
NWTPH-Dx	< 1,870 mg/kg

[1] If required under WAC 173-350-220

2.02 SOURCE QUALITY CONTROL

A. The Contractor shall submit one representative sample of the topsoil specified herein to the Engineer for analysis prior to importing it to the Project. The Engineer's acceptance

of any topsoil proposed for the Project by the Contractor shall be subject to consideration of the chemical substances identified in 40 CFR 300 and the Risk Reduction Standards approved for this Site.

B. The Contractor shall provide materials of each type from the same approved source throughout the Project. The Contractor shall notify the Engineer in writing prior to changing material sources, submit samples with sufficient time (i.e., at least 14 calendar days) for analysis, and receive written approval from the Engineer prior to transporting materials to the site for placement. No compensation will be made for materials that were not approved prior to delivery and placement or for material that does not meet the descriptions above.

PART 3 – EXECUTION

3.01 TOPSOIL PLACEMENT

A. Landscape Areas:

1. Grade and remove rock and debris as described above.
2. Place topsoil over the graded backfill to a depth specified in the Plans.
3. Grade the topsoil surface to conform to the lines and grades as shown on the Plans.
4. Topsoil shall be worked into the underlying layer for a depth of at least 6 inches.
5. Topsoil shall be installed to the depth indicated on the Plans.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02060

AGGREGATE MATERIAL

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. References
C. Submittals
D. Project Conditions
E. Source Quality Control
F. Structural Fill and Trench Backfill
G. Stabilization Fill
H. Aggregate for Hot Mix Asphalt (HMA)
I. Aggregate for Portland Cement Concrete
J. Aggregate for Crushed Surfacing Top/Base Course
K. Gravel Backfill for Piping Bedding
L. Sand Backfill for Pipe Bedding
M. Washed Pea Gravel
N. Clean Sand
O. Select Fill
P. Stockpiling

1.02 SUMMARY

A. This section includes materials proposed for import as Aggregate Materials to be used in this Project.

B. Related Sections:

1. Section 01330 – Submittal Procedures
2. Section 02120 – Transportation of Construction Debris, Decontamination Water, and Non-Hazardous Material
3. Section 02310 – Backfill and Grading
4. Section 02501 – Storm Drainage System
5. Section 02510 – Water Distribution System
6. Section 02535 – Sanitary Sewer Mains
7. Section 02601 – Cement Concrete Sidewalks
8. Section 02611 – Asphalt Concrete Paving
9. Section 02670 – Well Construction
10. Section 03301 – Cast-In-Place Concrete
11. Section 03930 – Concrete Rehabilitation

1.03 REFERENCES

A. Washington State Department of Transportation (WSDOT) Standard Specifications−2008, Division 9, MATERIALS.

B. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M147 – Standard Specification for Aggregate and Soil-Aggregate Sub-Base, Base, and Surface Courses.

2. AASHTO TP61 – Determining the Percentage of Fracture in Coarse Aggregate.

C. American Society of Testing and Materials (ASTM):

1. ASTM C117 – Standard Test Method for Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing.

2. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

3. ASTM D75 – Standard Practice for Sampling Aggregates.

4. ASTM D3740 – Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.

5. ASTM D422 – Standard Test Method for Particle Size Analysis of Soils.

D. United States Department of Agriculture

1. *Soil Taxonomy, A Basic System of Soil Classification for Making and Interpreting Soil Surveys*

1.04 SUBMITTALS

A. The Contractor shall submit, pursuant to Section 01330 – Submittal Procedures, recent results of test analysis of sieve and proctor for materials proposed for this Project as specified herein.

B. Submit written certification for all proposed backfill materials signed by the material supplier, stating that the material meets the material requirements specified herein. Submit this information to the Engineer for review for acceptance a minimum of fourteen (14) calendar days prior to proposed delivery of the specified material to the Site.

C. Submit sieve analysis and proctor test results for all imported material to the Engineer. Submit at least one set of test results for each material source as outlined below. If a submitted sample does not meet the Project Specification, additional testing shall be required by the Contractor and material supplier.

D. Submit name, address, and qualifications of a certified, independent materials testing laboratory proposed to perform quality control tests including on-site compaction tests for the imported aggregate, backfill, and hot mix asphalt (HMA) materials. Obtain the Engineer's approval of the proposed materials laboratory prior to the submittal of proposed material sources or sampling.

1. The Contractor's materials laboratory shall be a certified, independent testing company or agency meeting the requirements specified in ASTM D3740.

2. The Contractor's materials laboratory shall submit a certified test report to the Contractor and Engineer no later than fourteen (14) calendar days for each test performed.

1.05 PROJECT CONDITIONS

A. Materials to be furnished: Aggregate materials including excavation gravel borrow backfill, crushed surfacing aggregates, pipe bedding and trench backfill, hot mix asphalt aggregate, cement concrete aggregate.

B. Scope of Aggregate Materials Work: This includes furnishing (from either an on-site or off-site source), transporting the specified aggregate materials for use on the Project. The unit bid price per ton includes furnishing and placement of the specified aggregate materials as described in Products.

1.06 SOURCE QUALITY CONTROL

A. Notify the Engineer:

1. Prior to import of material to the Project.

2. Whenever the material appears to deviate from requirements of these Specifications or from previously obtained/supplied material.

3. When availability of on-site source materials, when utilized, becomes limited for the Project as shown on the Plans.

B. Frequency of Testing and Test Standards at Source:

1. Testing frequency for each individual aggregate material is covered in the following subsections or in the August 8, 2008 WSDOT Construction Manual. Any deviation must be approved by the Engineer prior to incorporation.

C. All costs associated with the Contractor's certified materials laboratory support, including all sampling and all testing and report submittals, shall be included in the various contract bid items and no additional compensation will be made.

PART 2 – PRODUCTS

2.01 STRUCTURAL FILL AND TRENCH BACKFILL

A. The Structural Fill and Trench Backfill material shall be used for general backfilling areas, storm drainage trenches, and utility trenches. This material shall meet the requirements specified in this subsection.

B. Structural Fill must only be placed above the water table. The water surface elevation is expected to fluctuate throughout the construction season as the water table elevation typically decreases in the summer.

C. Structural fill, i.e., gravel borrow, for backfill shall be obtained only from a commercial borrow source approved by Engineer prior to import. Lack of Engineer prior approval shall be reason for non-payment of that unit bid item as determined by the Engineer.

D. Backfill materials shall contain no hazardous substances that exceed the concentrations provided in this subsection. Prior to Project import, the Contractor shall provide a certified laboratory report verifying this requirement for backfill material has been met.

E. Structural fill, i.e., gravel borrow, material for the remediation excavation site shall consist of clean, granular material, either naturally occurring or processed, and shall meet the following requirements for grading and quality.

F. Testing of Structural Fill and Trench Backfill Materials (To be conducted by the Contractor's QC Firm):

1. WSDOT Standard Specification, 2008 Section 9-03

2. Grain Size Testing Requirements:

U.S Standard Sieve Size	Allowable Percent Passing
5-inch square	100
2-inch square	75-100
No. 4	50-80
No. 40	30 max.
No. 200	15 max.
Sand Equivalent	50 min.

All percentages are by weight. Note that the quantity of fines (material passing the No. 200 sieve) shall be decreased to a maximum of 5 percent if the fill is to be placed during wet weather conditions.

3. Chemical Testing: Contractor shall collect and analyze the proposed Structural Fill and Trench Backfill materials for the potential contaminants identified in the following table. One test for hazardous substances for the structural fill, i.e., gravel borrow source, must be completed prior to delivery of any structural fill/gravel borrow material to the Project. Following the initial testing, one test is required for every 5,000 tons of material delivered to the Site, or, if the coloration or odor of the imported material suggests that there may be, in the opinion of the Engineer, impacts in the imported gravel borrow structural fill, then further testing will be required. A minimum of one test for the listed chemicals for each visible change in material and at least one test for the listed chemicals for every borrow source shall be required:

Hazardous Substance	Maximum Concentration
Arsenic	20 mg/kg
Cadmium	2 mg/kg
Chromium VI	19 mg/kg
Chromium III	2,000 mg/kg
Lead	250 mg/kg
Mercury	2 mg/kg
NWTPH-Dx	1,870 mg/kg

2.02 STABILIZATION FILL

A. The Stabilization Fill shall be used for general backfilling areas, storm drainage trenches, and utility trenches backfilling that are below the water table. Given that the excavations may not be fully dewatered, backfill placed below the water table will need to be clean (little to no fines) granular material that goes in place in a self-compacting manner, and is easily compacted in a thick layer when compaction equipment is placed on the fill once it extends above the water surface elevation. This material shall meet the requirements specified in this subsection. The Stabilization Fill shall only be placed below the water table.

Given that the material will be placed below the water table, compaction testing below standing water will not be possible. A large compaction effort will be required on the backfill at the point where it protrudes above the water level.

B. Stabilization Fill shall be obtained only from a commercial borrow source approved by Engineer prior to import. Lack of Engineer prior approval shall be reason for non-payment of that unit bid item as determined by the Engineer.

C. Stabilization Fill shall contain no hazardous substances that exceed concentrations listed below. Prior to Project import, the Contractor shall provide a laboratory report verifying this requirement for backfill material.

D. Stabilization Fill shall consist of clean, granular material, either naturally occurring or processed, and shall meet the gradation requirements below.

E. Testing of Stabilization Fill (To be conducted by the Contractor's QC Firm):

1. WSDOT Standard Specification, 2006, Section 9-03

2. Grain Size Testing Requirements – Northwest Developed Zone:

Sieve Size	Percent Passing
2 ½ square	100
2 square	65-100
¾ square	40-80
U.S. No. 4	5 (max.)
U.S. No. 100	0-2
% Fracture	75 (min.)

All percentages are by weight.

3. Chemical Testing: Contractor shall collect and analyze the proposed Stabilization Fill material for potential contaminants identified in the appropriate table in Section 2.01(F)(3). One test for hazardous substances for the stabilization fill source must be completed prior to delivery of any structural fill/gravel borrow material to the Project. Following the initial testing, one test is required for every 5,000 tons of material delivered to the Site, or, if the coloration or odor of the imported material suggests that there may be, in the opinion of the Engineer, impacts in the imported material, then further testing will be required. A minimum of one test for chemicals for each visible change in material and at least one test for chemicals for every borrow source shall be required.

2.04 AGGREGATES FOR HOT MIX ASPHALT (HMA)

A. Aggregates shall meet the requirements of WSDOT Standard Specifications, 2008, Section 9-03.8

2.05 AGGREGATES FOR PORTLAND CEMENT CONCRETE

A. Aggregates shall meet the requirements of WSDOT Standard Specifications, 2008, Section 9-03.1

2.06 AGGREGATE FOR CRUSHED SURFACING TOP/BASE COURSE

A. Aggregate for crushed surfacing top/base course shall meet the requirements of WSDOT Standard Specifications, 2008, 9-03.9(3).

B. Testing of aggregate and backfill material by the Contractor's quality control firm shall be in accordance with WSDOT Standard Specifications, Division 9.

2.07 GRAVEL BACKFILL FOR PIPE BEDDING

A. Backfill for pipe zone bedding shall meet the requirements of WSDOT Standard Specifications, 2008, Section 9-03.12(3).

B. The Contract unit price for aggregate, crushed surfacing material, gravel backfill for pipe bedding, structural fill/gravel borrow for remediation excavation embankment construction shall be by ton or cubic yard or incidental to pipe measurement as described in each appropriate section.

2.08 SAND BACKFILL FOR PIPE BEDDING

A. Sand Backfill for Pipe Zone Bedding Material shall be clean non-cohesive natural, unwashed sand that meets the following sieve gradation, or as approved by the Engineer:

Sieve Size	Percent Passing
No. 6	95-100
No. 8	85-95
No. 50	15-30
No. 200	0-2

B. All sand fill material beneath the pipe shall be spread and compacted to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished sub grade surface by the withdrawal of pipe slings or other lifting tackle.

2.09 WASHED PEA GRAVEL

A. Washed Pea Gravel backfill shall be clean, washed gravel that meets the following sieve gradation, or as approved by the Engineer:

Sieve Size	Percent Passing
1-1/2"	100
1"	95-100
¾"	90-100
½"	20-30
3/8"	0-5
No. 4	<1%

2.10 CLEAN SAND

A. Clean sand backfill shall be clean sand that meets the following sieve gradation, or as approved by the Engineer:

Sieve Size	Percent Passing
1/2”	90-100
No. 4	57-100
No. 10	4-100
No. 50	3-30
No. 100	0-4
No. 200	0-1.5

2.11 SELECT FILL

A. Non-impacted overburden material, trench excavation spoils, and cap excavation spoils may be reused as Select Fill as determined by the Engineer. In general, this material shall be free of rock larger than 6-inches, organic material, and other deleterious materials not suitable as solid fill.

PART 3 – EXECUTION

3.01 STOCKPILING

A. Reference Sections 01500 – Temporary Facilities and Controls, Section 01575 – Temporary Erosion and Sediment Control, and Section 02110 – Excavation and Stockpiling for requirements related to management of material stockpiles.

B. Store materials only in work areas designated for stockpiling as shown on the Plans or as approved by the Engineer. Stockpiled material shall not obstruct or encumber other Project construction activity.

C. Stockpiles of any impacted material shall be placed on protective plastic flooring and the edges shall be controlled and protected by rolling the plastic covering over the berm to not allow any material or runoff water from escaping the stockpile area.

D. All costs associated with daily maintaining the stockpile floor and berm fabric shall be included in the Contract Unit Bid Price for the material and no further compensation will be made.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02110

EXCAVATION AND STOCKPILING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Submittals
C. References
D. Quality Control
E. Project Conditions
F. Coordination and Scheduling
G. Materials
H. Soil Amendment Material
I. Preparation
J. Overburden Excavation
K. Remedial Excavation
L. Sheet Pile Pre-Excavation
M. Cap Excavation
N. Excavation- General
O. Confirmation Sampling
P. Stockpiling-General
Q. Stockpile Management
R. Stockpile Inspection
S. Stockpile Water Management

1.02 SUMMARY

A. This section includes Excavation and Handling of Non-impacted and Impacted Materials, including that for utility trenching, school property excavation, and roadway excavation on the Project, and the hauling and stockpiling of excavated materials, to areas shown on the Plans.

B. Related Sections:

1. Section 01140 – Work Restrictions
2. Section 01500 – Temporary Facilities
3. Section 01575 – Temporary Erosion and Sediment Control
4. Section 01580 – Environmental Controls
5. Section 01722 – Construction Surveying
6. Section 02120 – Transportation of Construction Debris, Impacted Decontamination Water, and Non-Hazardous Materials
7. Section 02130 – Decontamination
8. Section 02220 – Demolition
9. Section 02310 – Backfilling and Grading

10. Section 02317 – Trenching for Site Utilities

1.03 SUBMITTALS

A. The Contractor shall establish and maintain Daily Trucking Logs for contract item excavation and haul as separate items of work. Trucking Logs shall include the Contract Item designation, date, name of the driver, and number of the truck for each load shipped from the site. The Contractor shall bear sole responsibility for properly documenting and daily submission of the correct Contract Item. Insufficient documentation shall be grounds for nonpayment of that load. The Daily Trucking Logs shall be submitted to the Engineer on a daily basis as described in Section 01330 – Submittal Procedures.

1.04 REFERENCES

A. Washington State Department of Transportation (WSDOT) Standard Specifications, 2008.

B. ASTM C977 – Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization

C. ASTM D 1505 – Standard Test Method for Density of Plastics by the Density-Gradient Technique or

D. ASTM D 1238 – Condition E Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.

1.05 QUALITY CONTROL

A. The Contractor's Registered Land Surveyor shall stake excavation boundaries denoted on the Plans and shall perform the initial survey as specified in Section 01722-Construction Surveying.

B. Contractor personnel shall perform surveying to establish and record elevations during the course of the excavation work for the purpose of determining depth, horizontal dimensions, and the volume.

C. The Engineer shall be allowed access to excavation areas to perform surveying if determined to be necessary by the Engineer.

D. Verification of final excavation horizontal limits and depths shall be accomplished with accuracy acceptable to the Engineer. The Contractor shall provide this information electronically as well as on paper. During the progress of the work, the Contractor shall provide survey data as the excavation progresses that consist of the following:

1. Horizontal limits of completed excavation in sufficient detail to allow accurate computation of the volume.

2. Vertical limits of excavation in sufficient detail to verify elevations. Survey support shall be sufficiently complete to establish the progress of the completed work.

1.06 PROJECT CONDITIONS

A. The Contractor is solely responsible for the stability of the excavation slope. Excavation work shall be in compliance with applicable OSHA, WISHA and Town of Skykomish regulations.

B. The Contractor shall have a competent person, as required by WAC 296-155-650(2 f), on the site at all times to properly evaluate sloping/shoring requirements of excavations. This person shall be identified in the shoring submittal and shall have the required training to be a competent person.

C. The Contractor shall prepare an excavation shoring detail and installation method as part of the contract work, if shoring is deemed necessary by the Contractor. The shoring design and installation method shall be reviewed by the Engineer prior to start of excavation work. Contractor shall be responsible for all shoring design and obtaining all applicable permits pertaining to the shoring prior to beginning excavation.

D. Work shall not disturb or damage existing structures, utilities, or other facilities not indicated to be removed, unless the removal of such items is shown on the Plans or is previously approved by the Engineer. Damaged facilities shall be repaired or replaced at the Contractor's expense as determined by the Engineer.

E. The Contractor shall take every effort necessary to prevent cross-contamination and re-contamination of clean areas. If a previously cleaned area is cross-contaminated by the Contractor's operations, the Contractor shall, at the Engineer's direction, excavate and dispose of, and replace any cross-contaminated material at Contractor's expense.

F. Tracking of debris and excavated materials from the main work site or from any trenching operation on this Project onto the streets or private properties is strictly forbidden. Should any street or private property receive any contaminated material from the excavation operation, it shall be immediately and completely cleaned and hauled by the Contractor to a suitable disposal site.

G. Work shall involve the handling of materials, including soil, groundwater, and excavation water, containing substances that are potentially harmful to the health and safety of construction personnel. All Project work is to be performed in compliance with applicable OSHA and WISHA regulations and pursuant to the Contractor's Site-Specific Health and Safety Plan.

H. Dust control and odor control measures during the excavation operation shall be in accordance with the requirements of Section 01580 – Environmental Controls.

I. The Contractor is advised of the potential for encountering a water table within the remediation excavation elevation and the subsequent necessity of excavating and backfilling under water.

J. The Contractor is advised of the potential of encountering large boulders and cobbles within the remedial and trench excavation areas. The Contractor shall plan sufficiently for removal or breaking via hydraulic methods any large boulders encountered. All costs associated with removal or breaking of large boulders shall be considered incidental to the Contract Bid Item for Excavation. No further compensation will be made.

K. The Contractor is advised that free product could be encountered during the excavation operations. See Section 02250 – Oil Recovery for requirements.

1.07 COORDINATION AND SCHEDULING

A. Coordinate excavation work with stockpiling, hauling, and loading the excavated materials onto trucks for off-site disposal.

B. The Contractor will coordinate with utility companies for protection and/or relocation of their facilities prior to commencement of excavation.

C. The Engineer will monitor excavation progress and collect soil samples to confirm contaminated soil removal. Progress soil sample analysis data will be available within approximately 36 hours from the time that the sample is turned in to the lab. The Contractor shall assume that a total sample turnaround time is 72 hours from the time samples are collected and plan excavation operations to be inclusive of an allowance for soil sample analysis turnaround time. No additional compensation for delay will be allowed for soil sample analysis turnaround time.

D. There is a Fire Department Connection (FDC) on the north side of the Supplemental Excavation area. The Contractor shall maintain access to this connection during construction and coordinate access with the local Fire Department as needed.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Furnish all materials, equipment, and labor required for the construction and maintenance of stockpiles in accordance with WSDOT Standard Specifications, Section 3-02 or as specified herein. All costs involved in preparing, constructing, isolating, covering, protecting, and maintenance of the stockpiles shall be included in the unit prices for the excavated or demolished impacted or non-impacted materials being stockpiled.

B. Stockpile bottom liners, if required for temporary stockpiling of contaminated materials on clean soils, shall have a minimum thickness of 40 mils and shall consist of high-density polyethylene (HDPE) and shall be resistant to weathering and degradation due to contact with impacted materials for the duration of the Project work.

Once the liners are in place and the stockpile area ready to receive, store material, the Contractor shall leave a floor of material on the bottom six to twelve inches to protect the liner from tear by the loader during the stockpiling or loading operation. Should the liner be torn, the Contractor will immediately repair the tear and not allow impacted material or run-off to escape the stockpile.

Stockpile covers shall be 6-mil (minimum thickness) polyethylene sheeting. The stockpile cover sheets shall be of sufficient length and width to completely and fully cover all of each stockpile.

C. Stockpile covers and liners shall be free of holes or tears. Defective material shall be immediately repaired or replaced and not allow leakage or escape of material from the stockpile area, as determined by the Engineer.

D. Furnish sand bags or other devices as approved by the Engineer of sufficient quantity and weight and with sufficiently close spacing to completely and fully hold the stockpile cover in position.

2.02 SOIL AMENDMENT MATERIAL

If the Contractor determines soil amendment is required Soil Amendment Material consisting of quick or hydrated lime that meets the requirements of ASTM C977 in its most recent version. The Contractor shall provide quick or hydrated lime in one (1) ton sacks and mix as directed by the Engineer to adjust the moisture condition of the excavated material to pass the paint filter test required by the disposal facility.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prior to beginning excavations, the Contractor's Registered Land Surveyor shall stake excavation limits indicated on the Plans and in the Survey Control Table. Protect and preserve the survey stakes during the excavation and backfill work. Replacement of survey control staking shall be the sole responsibility of the Contractor.

B. Comply with the requirements of the various utility companies for protection of underground utilities as necessary.

C. Erect and maintain erosion control filter fabric fences, construction limit orange fencing, catch basin silt bags, straw bales, other erosion sediment control features, traffic barriers and control devices, detour signing, and security fences around excavations and provide other necessary site controls and safety measures as specified in Section 01500 – Temporary Facilities and Section 01580 – Environmental Control.

3.02 OVERBURDEN EXCAVATION

A. The Contractor shall layout a 25-foot by 25-foot sampling grid in the Supplemental Excavation area. The grid will be established to be reproducible for the duration of the work.

B. The Contractor shall provide labor and equipment to assist the Engineer in collecting overburden samples from approximately 4.5 feet below ground surface in each grid and from locations selected by the Engineer along trench alignments.

C. The results of grid sample analysis will be used to determine the appropriate handling of the overburden material. Overburden determined to be non-impacted shall be used on-site for backfill. Non-impacted overburden material shall be hauled using tight containment vehicles to the area for stockpiling indicated on the Plans or as specified by the Engineer.

3.03 REMEDIAL EXCAVATION

D. The eastern portion of the Supplemental Excavation area excavation prism as shown on the Plans was previously excavated and contaminated soil removed. Contaminated soil above cleanup levels was determined to be present in western portion of the excavation prism by a sidewall sample collected and analyzed as part of prior remediation operations. The limit of backfill was delineated by the installation of a geotextile liner. It is anticipated that the soil excavated from east of the liner and above approximately 4.5 feet below ground surface is anticipated to be clean and suitable for re-use.

E. Contractor shall excavate and stockpile the overburden material. The Engineer will use field screening methods to determine overburden excavation limits.

F. The Plans show the approximate limits and elevations of the remedial excavation area the south of the School and the area required for construction of the treatment area cap and installation of the sheet pile. Soil removal shall be to the horizontal and vertical limits indicated on the drawings. Demolition of slabs and surface structures shall be in accordance with Section 02220 – Demolition. Contractor shall extend the limits of the excavation beyond those shown on the Plans only at the specific direction of the Engineer. The final excavation limits for the remedial excavation south of the School will be established by soil sampling that will take place after the initial excavation reaches the excavation limits shown on the Plans.

G. Excavation will include removing soil as necessary to reach the estimated horizontal and vertical extents of impacted soil shown on the Plans. The anticipated excavation depth is approximately 9 to 15 feet, part of which is expected to be below the water table. The Contractor should anticipate excavating and backfilling 3 to 9 feet below the water table.

H. All non-impacted overburden excavated material shall be hauled using tight containment vehicles to the area for stockpiling indicated on the Plans or as specified by the Engineer. Impacted materials shall be loaded directly into trucks to minimize the potential for mixing impacted soil with non-impacted soil.

I. It is anticipated that impacted soil excavated below groundwater levels will need to dewater prior to loading. The Contractor shall sequence excavation to provide for interim stockpiling of wet soil on a bench within the excavation or within the excavation area, or use sorbent material to make excavated material suitable for transport.

J. No contaminated debris, mud, or water will be allowed to be spilled onto public street right-of-ways. Any such spillage shall immediately be cleaned and hauled by the Contractor to the stockpile area for containment and storage. Should the Contractor not promptly complete spillage clean-up, the Engineer will direct others to perform the clean-up immediately and the Contractor will be back-charged based on force account methods for that work by others.

K. Excavation shall be coordinated with excavation support and environmental controls as specified in Sections 01580- Environmental Control and 02260- Excavation Support and Protection Shoring.

L. Free product is likely to be encountered from the excavation areas. The Contractor shall provide and utilize a satisfactory method for removing oil from the excavation area resulting from excavation below the water table, product released from excavation operations, and seepage from the walls of excavation. Free product removal requirements are specified in Section 02250 – Oil Recovery.

M. The Contractor shall excavate additional impacted materials beyond the Plan horizontal and/or vertical limit, if field determinations indicate impacted soils at the limits of excavation exceed the cleanup goal. The Contractor shall perform this additional excavation only as directed by the Engineer. Payment will be made in accordance with these Plans and Specifications and Remedial Excavation, per cubic yard as determined by surveying cross-sections.

3.03 SHEET PILE PRE-EXCAVATION

A. Sheet pile pre-excavation will involve excavation of non-impacted material from the sheet pile alignment as required for sheet pile installation. Excavation depth is anticipated to be approximately 3 to 4 feet below ground surface. This excavation is not anticipated to encounter groundwater or impacted soil materials.

B. All non-impacted overburden excavated material suitable for re-use as determined by the Engineer shall be hauled using tight containment vehicles to the area indicated on the Plans or as specified by the Engineer.

C. Landscaping debris, sod, and soil from Sheet Pile Pre-Excavation not suitable for re-use on site shall be disposed of at a commercial recycling facility or landfill permitted to receive this material and as approved by the Engineer.

3.04 CAP EXCAVATION

A. Cap excavation will involve excavation of non-impacted material, topsoil, surface improvements, pavement, landscaping, and sod from the area between the School and the sheet pile as shown on the Plans. Excavation depth is anticipated to be approximately 1 foot below ground surface. This excavation is not anticipated to encounter groundwater or impacted soil materials.

B. Landscaping debris, sod, and soil from Cap Excavation not suitable for re-use on site shall be disposed of at a commercial recycling facility or landfill permitted to receive this material and as approved by the Engineer.

C. All non-impacted overburden excavated material suitable for re-use as determined by the Engineer shall be hauled using tight containment vehicles to the area indicated on the Plans or as specified by the Engineer.

3.05 EXCAVATION – GENERAL

A. The Contractor shall provide project surveying support in accordance with Section 01722 – Construction Surveying.

B. Excavation slopes and benches shall conform to OSHA/WISHA/Town of Skykomish requirements at all times.

C. Contractor shall be responsible for determining proper sloping of excavation walls based on the evaluation of actual soil conditions by the Contractor's competent person. The Contractor's competent person shall meet the requirements of WAC 296-155 Part N.

D. The Contractor's competent person shall inspect excavations daily to verify stability of slopes and benches, including excavation support system (i.e., shoring).

E. Work must comply with restrictions specified in Section 01140 – Work Restrictions.

3.06 CONFIRMATIONAL SAMPLING

A. Upon achieving the Plan limits of the remedial excavation, verified by survey, the Contractor shall notify the Engineer. The Contractor will survey a 20 feet by 20 feet grid that covers the entire excavation bottom. Upon this notification, verification of the limits of excavation, and verification of the grid, the Engineer will collect soil samples from the bottom and sidewalls of the excavation.

B. Soil sample analytical results will be provided in writing to the Contractor for backfilling. Results from soil sample analysis will be made available within 72 hours (excluding weekends and holidays) after submittal of the soil samples to the laboratory. The Contractor shall include time for sample collection, sample analysis and the potential for additional excavation into the Project schedule. No additional compensation for excavation beyond the Plan limit of excavation will be allowed except when additional excavation is directed by the Engineer. Additional excavation, when directed by the Engineer, will be paid for as additional cubic yards of excavation measured by survey cross-section.

3.07 STOCKPILING – GENERAL

A. Establish stockpiles as necessary for management of excavated materials prior to transport of excavated materials for on-site use as backfill. The Contractor shall stockpile excavated clean overburden in the soil handling facility south of the Railyardand/or as pre-approved by the Engineer.

B. Stockpile side slopes shall not exceed a slope of 1 horizontal to 1 vertical (1H:1V).

C. The edges of the stockpiles shall be located no closer than 1 foot from the designated Project perimeter.

A. The overburden stockpile areas shall be relatively leveled and compacted to non-yielding condition. The stockpile area site preparation and related Temporary Erosion and Sediment Control measures shall be inspected by the Engineer before use.

B. Install stockpile cover, if requested by the Engineer, in a manner that minimizes wrinkles and provides for a straight placement. All seams shall be taped or weighted down full length and there shall be at least 4 feet of overlap of all seams. Seams should then be rolled and staked or tied. Place sandbags or other pre-approved clean weighted objects on the cover at sufficiently close spacing to prevent uplift from wind. The toe of slopes shall be tightly secured and covered by the sheeting. Maintain complete and full covering over night and over weekends.

C. Protect the cover from damage. Remove and replace damaged polyethylene sheeting as needed.

D. Contractor shall use the designated stockpile area in the Railyard as pre-approved by the Engineer. The Contractor shall not stockpile material on School property.

3.04 STOCKPILE MANAGEMENT

A. Continually prevent soil dust from becoming airborne. Cover the stockpiles whenever the stockpiles are not being used and at end of each work day.

B. Provide run-on controls to divert storm water away from stockpiles.

C. Stockpiles shall be managed to prevent soil erosion or sedimentation in accordance with Section 01575 - Temporary Erosion and Sediment Control.

3.05 STOCKPILE INSPECTION

A. The Engineer will inspect material stockpiles to affirm the integrity and maintenance of the stockpile cover system when recovered.

B. All deficiencies noted by the Engineer and conveyed to the Contractor shall be immediately corrected to the satisfaction of the Engineer.

C. Contractor shall inspect each stockpile daily for damage and repair the damage immediately.

3.06 STOCKPILE WATER MANAGEMENT

A. In the event that water is developed in the stockpile area as a result of gravity drainage, this drainage water shall be contained and allowed to infiltrate.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02120

TRANSPORTATION OF CONSTRUCTION DEBRIS, IMPACTED DECONTAMINATION WATER, AND NON-HAZARDOUS MATERIALS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Submittals
C. Hauling of Demolition Debris, Impacted Decontamination Water, and Non-Hazardous Materials
D. Manifests

1.02 SUMMARY

A. This section includes loading and transportation of impacted material, clearing and grubbing materials, demolition debris, impacted decontamination water, and other non-hazardous materials to a licensed and previously approved facility for the Project.

B. Impacted soils, non-impacted soil not suitable for re-use, cleared and grubbed vegetation, construction debris, impacted decontamination water, and other non-hazardous materials shall be transported by waste haulers retained and contracted by the Contractor and approved by the Engineer.

C. The Contractor shall be fully and completely responsible for the proper loading of the waste containers and for abiding by the load and weight limits for all vehicles leaving the Project, in addition to being responsible for any fine, tax, penalty or judgment resulting from overweight or improperly loaded rail or trucking vehicle leaving the Project with excavated material.

D. Related Sections:

1. Section 01150 – Health and Safety
2. Section 01325 – Progress Schedules and Reports
3. Section 01330 – Submittal Procedures
4. Section 02110 – Excavation and Stockpiling
5. Section 02130 – Decontamination

1.03 SUBMITTALS

A. Provide the Engineer a list of proposed waste haulers for the work described in this section for review and approval. Submit copies of all necessary permits and certifications of listed waste haulers to the Engineer for approval at least five (5) working days prior to the scheduled start of the Work.

B. Impacted soils will be disposed of at a facility contracted directly to BNSF.

C. For materials other than impacted soils, provide the Engineer a list of proposed disposal facilities for the work described in this section for review and approval. Submit copies of all necessary permits and certifications to the Engineer for approval at least five (5) working days prior to the scheduled start of the Work.

D. The Contractor shall submit written certification of the proper transport and disposal of all materials to the Engineer within one (1) working day after receipt of the documentation. Submit copies of all waste manifests, weight tickets, and bills of lading to the Engineer.

E. The Contractor's Daily Construction Report shall include detailed documentation of all loading and transport activities as specified in Section 01325 − Progress Schedules and Reports.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 HAULING OF DEMOLITION DEBRIS, IMPACTED DECONTAMINATION WATER, AND NON-HAZARDOUS MATERIALS

A. Obtain all required transportation permits for shipment of impacted and non-impacted materials, decontamination water/materials and demolition debris.

B. Transportation of all material shall be in accordance with applicable state, USDOT, and other applicable regulations.

C. The Contractor shall be responsible for furnishing and operation of all vehicles and containers for transportation of impacted materials, non-impacted materials, decontamination water, demolition debris, and non-hazardous materials from the Project site.

D. Each truck bound for an off-site landfill shall be covered with a heavy-duty tarpaulin secured to the top or sides of the container or transfer facility.

E. The Contractor shall provide flaggers as necessary when haul trucks enter and exit the public right-of-way to protect pedestrian and motoring safety.

F. The Contractor shall visually inspect each truck bound for an off-site landfill before it leaves the site to ensure that the tailgate and tarpaulin are secure and completely clean of debris. Decontaminate each vehicle as specified in Section 02130 − Decontamination as needed. Verify that covers and tarpaulin are secured to the necessary parts of the truck

bed. Bed lined trucks are not required for transport of materials and shall be used only as directed by the Engineer.

G. The Contractor shall promptly clean up any spills of Project excavated material on public haul routes, should they occur, with suitable equipment at no cost to this Project.

H. The load weight shall be documented by the landfill or off-site disposal facility certified scale and certified scalemaster stamp. The Contractor shall submit copies of all landfill or off-site disposal facility scale weight tickets to the Engineer. Weight tickets without the scalemaster's stamp will be subject to rejection.

3.02 MANIFESTS

A. The Engineer will prepare manifests on behalf of the Owner, BNSF, as well as prepare necessary documentation for transportation and disposal of non-hazardous impacted decontamination water/materials.

B. Non-hazardous waste bills-of-lading or other tracking documents will be provided by the Engineer for each individual load. Each tracking document will be signed by designated authorized agent of the Owner as a shipper, the truck driver as a transporter, and by the landfill and/or other designated off-site facility operator.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02130

DECONTAMINATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Submittals
C. Decontamination Facilities
D. Decontamination of Vehicles and Equipment
E. Personnel Decontamination
F. Decontamination Methods
G. Management of Decontamination Residuals

1.02 SUMMARY

A. This section covers the decontamination of personnel and equipment transitioning from the Exclusion or Work Zones into the Support Zones of the remediation site.

B. Related Sections:

1. Section 01150 – Health and Safety Requirements
2. Section 01500 – Temporary Facilities
3. Section 02110 – Excavation and Stockpiling
4. Section 02120 – Transportation of Construction Debris, Decontamination Water, and Non-hazardous Materials

1.03 SUBMITTALS

A. Submit prior to mobilization, for the Engineer's review, decontamination procedures as part of the Contractor's HASP specified in Section 01150. Provide the following information:

1. Number and location of decontamination and wheel wash stations if required
2. Decontamination methods and equipment
3. Procedures to prevent cross-contamination of clean areas
4. Methods and procedures to minimize worker contact with contaminants during removal of personal protective equipment (PPE)
5. Procedures for inspection and decontamination of vehicles leaving the Site
6. Procedures for disposal of personal PPE
7. Procedures for the collection, treatment, and disposal of all decontamination water and residuals

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 DECONTAMINATION FACILITIES

A. Construct and maintain decontamination facilities and wheel wash stations as described in Section 01500 – Temporary Facilities, on the Plans and in the Engineer-approved Technical Execution Plan.

3.02 DECONTAMINATION OF VEHICLES AND EQUIPMENT

A. Prior to exiting the Exclusion Zone, the Contractor shall inspect and decontaminate all vehicles and equipment that have entered the Exclusion Zone. All decontamination shall be accomplished in the Decontamination Zone as specified in Section 01500 – Temporary Facilities.

B. Decontamination work shall include removal of soil and residues from the chassis (which includes undercarriage, suspension, tires and wheels, tracks, loader buckets, excavator buckets) and other parts of the vehicle known to have contamination or visually appearing to be contaminated.

C. The Contractor shall take care while decontaminating vehicles to avoid contaminating personnel, other parts of the vehicle or equipment, or the surroundings. Personnel involved in vehicle and equipment decontamination shall be dressed in the appropriate level of PPE as determined by the HASP. All personnel shall follow all applicable safety procedures specified in Section 01150 – Health and Safety Requirements.

D. Inspect and decontaminate haul trucks after loading and before the haul trucks exit the Exclusion Zone each time.

3.03 PERSONNEL DECONTAMINATION

A. Ensure that personnel who have entered the Exclusion Zone perform decontamination as required in Section 01150 - Health and Safety Requirements prior to exiting the Decontamination Zone.

3.04 DECONTAMINATION METHODS

A. Physical decontamination techniques shall include, but are not limited to, brushing and spraying with a pressure washer.

B. Brushing shall consist of removal of loose materials with the use of a broom or brush.

C. A pressure washer shall be used to provide application of water of sufficient pressure, residence time, and agitation to remove soil and contaminated residuals from surfaces.

D. Surfactants and detergents must be approved by the Engineer prior to use in decontamination operations.

E. All equipment decontamination procedures shall be performed in a decontamination facility as specified in Section 01500- Temporary Facilities.

F. Overspray barriers shall be provided on each side of the decontamination area to prevent contamination of adjacent areas.

G. Manage decontamination residuals, including water, soil, residues, used PPE, and other materials removed during decontamination as specified in subsection 3.05.

H. Materials handling procedures may be designed such that trucks are received, loaded, and depart without entering an exclusion zone and remain on paved or gravel areas. This approach can be used to eliminate the necessity for wheel wash facilities if designed and managed in a manner that prevents off site distribution of contaminated soil, and is approved by the Engineer.

3.05 MANAGEMENT OF DECONTAMINATION RESIDUALS

A. Collect and manage decontamination solids and liquids as specified in Section 02120− Transportation of Construction Debris, Decontamination Water, and Non-hazardous Materials.

B. Manage contaminated PPE with impacted soil for landfill disposal.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02150

GEOTECHNICAL INSTRUMENTATION AND MONITORING

PART 1–GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Quality Assurance
C. Submittals
D. Definitions
E. Pre-construction Survey
F. Instrumentation Installation and Plan
G. As-Built Drawings
H. Monitoring Data
I. Corrective Action Plan
J. Design Criteria
K. Availability of Data
L. Right of Entry
M. Materials
N. Survey System
O. Tiltmeters
P. Datalogger
Q. Instrumentation Data Management System
R. Protective Enclosures
S. Automated Total Station
T. Execution-General
U. Instrument Installation
V. Protection and Maintenance
W. Instrumentation Monitoring
X. Instrumentation Monitoring Limits and Action Levels
Y. Removal of Geotechnical Instrumentation

1.01 SUMMARY

A. This Section specifies settlement or movement monitoring required to monitor the building structure during intrusive construction activities including excavation, backfilling, compaction, and sheet pile installation around the contaminated area of the existing school building. The contractor has a choice of either installing an automated total station system or five automatic tiltmeters that would measure building movement. The real time results shall be automatically uploaded to a web site so the data can be monitored offsite.

B. Relation Sections

a. 01500- Temporary Facilities

1.02 QUALITY ASSURANCE

A. Referenced Standards: Not Used

B. Qualifications:

1. Surveyor: The initial set up or baseline for either approach shall be performed under the direct supervision of an independent licensed Professional Land Surveyor registered in the State of Washington.

1.03 SUBMITTALS

A. Procedures: Section 01330.

B. Qualifications.

C. Pre-construction video survey of the surrounding buildings and structures within 100 horizontal feet of the school structure.

D. The monitoring approach chosen shall have protection from vandalism, the weather and power failure built into them. This protection shall be part of the complete system approach chosen. The system must operate for a maximum of 5 years. During the non-flushing season, the monitoring equipment could be removed and stored safely for re-installation the next season.

E. Within 5 working days after approval of the monitoring approach one set of operating manuals for each type of instrument, including read-out devices and appurtenant equipment required for a complete installation.

F. Baseline values for each appropriate instrument posted electronically to the Instrumentation Data Management System.

G. Data obtained during the monitoring as required in the Contract Drawings posted electronically to the Instrumentation Data Management System.

H. As-built drawings.

I. Monitoring data memo.

1.04 DEFINITIONS

A. Optical Survey Monitoring: Precise field measurements using survey techniques for determination of elevations, coordinates, and distances for performing geotechnical instrumentation monitoring.

B. Geotechnical Instruments:

1. Structure Settlement Points:
   a. Fixed markers placed on structures for the purpose of monitoring changes in elevations of existing ground, new and existing structures, and existing utilities.
   b. Monitored by optical survey methods to determine vertical or horizontal displacements.

2. Tiltmeters:
   a. High-resolution, narrow-angle sensor used to monitor changes in the inclination of a structure.

C. Instrument Reference Elevation Points:

1. Fixed markers installed integral to and permanently marked on all instruments.
2. Intended for monitoring of instrument installation surface elevations.

D. Action Level: Specified amount of measured movement at which point action shall be taken to the excavation and construction operations.

1.05 PRE-CONSTRUCTION SURVEY

A. A detailed video survey shall be performed during the pre-construction survey of existing structures within 100 feet of a remediation excavation and sheet pile installation. A copy of the video data shall be given to the engineer prior to starting work.

1.06 INSTRUMENTATION INSTALLATION AND PLAN

A. Schedule and outline of procedures and timing for instrument installation and performance of monitoring:

1. Schedule to include summary table for all instrument installations by number and location and to include detailed monitoring timetable as follows:

   a. Timing of each instrument installation.
   b. Initial baseline monitoring schedule.
   c. Timing of monitoring commencement and schedule of monitoring for each settlement point and piece of geotechnical instrumentation.

2. Procedure to confirm that instruments are working correctly following installation.

3. Data review process for comparison to indicated Action Levels.

B. Specifications and installation procedures for each type of settlement point and geotechnical instrumentation.

C. Detailed plan of instrumentation locations, including: proposed instrumentation locations, locations of data loggers or computers, cable routing to data loggers or computers, and communication systems (if used).

D. Details including casing and covers.

E. Certification: Manufacturer's certification that products, materials, and equipment furnished meets the specified requirements.

F. Documentation and initial factory calibration certificates for all geotechnical instruments and readout instruments to be used.

G. Sample data forms and instrumentation data, including sample instrument calibration data, and construction information (i.e. Easting and Northing coordinates, offset from track centerline, etc.) for each settlement point and geotechnical instrument.

H. Description of Instrumentation Data Management System (IDMS), including:

1. General description of the system.
2. How data is posted to IDMS.
3. How data is viewed in IDMS.
4. Reports generated in IDMS.
5. Alarms and notification through IDMS.
6. How access is controlled by IDMS and by whom.

1.07 AS-BUILT DRAWINGS

A. Settlement points and Instrument Reference Elevation Points on a maximum scale of 1-inch equals 20-feet; include elevation and Easting and Northing coordinates.

1.08 MONITORING DATA

A. Obtain data and readings in accordance with schedule indicated on the Drawings.

B. Upload monitoring data and readings, as applicable, to the IDMS on a daily basis or as shown on the Drawings.

C. Prepare data plots, review reports and plots for accuracy and completeness, and submit paper copies of data reports and plots from monitoring points within twenty-four hours of taking the monitoring data and readings for monitoring data and readings not uploaded to the IDMS.

1.09 CORRECTIVE ACTION PLAN

A. Details of actions to be taken in the case of settlement exceeding the Action Levels indicated on the Drawings.

B. Details of actions to be taken in the case of movement exceeding the limit of movement indicated.

C. Include operational changes to reduce the rate of soil movement, settlement, or heave.

1.10 DESIGN CRITERIA

A. Tolerances:

1. Establish the initial elevations of settlement points to 0.01 foot.
2. Record the subsequent elevations of settlement points to 0.01 foot.
3. Achieve level circuit closure with an error of closure of 0.017N-feet or less, where N is the circuit distance in miles.
4. Establish the initial horizontal coordinates of settlement points to 0.01 foot.

1.11 AVAILABILITY OF DATA

A. Do not disclose data reports and all other unprocessed data, readings, and observations to third parties.

B. Data shall be uploaded in real time to an accessible web site set up for review where the template will be established showing the threshold values and the relationship of the reading to them.

1.12 RIGHT OF ENTRY

A. Right of entry to BNSF property as indicated for the installation and monitoring of settlement points to be provided by BNSF.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Provide instrumentation reading devices, fixtures, cables, and necessary software for the various monitoring systems.

B. Water: Fresh and potable water.

C. Epoxy Mortar: Two-component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces. Use Sikadur 32 Hi-Mod produced by Sika Chemical Corp., or approved equal.

D. Access covers for settlement points:

1. Frame: Heavy duty steel or cast iron construction.
2. Lid:
   a. Solid.
   b. Steel or cast iron.
   c. Locking (requiring a flush surface entry).
   d. Gasketed.
3. Dimensions: Appropriate to instrumentation requirements.

2.02 SURVEY SYSTEM

A. Structure Settlement Points: Adhesive-backed targets, Leica Models #635-317 (20 mm square), #635-318 (40 mm square), or #635-319 (60 mm square) or approved equal.

B. Protective Enclosures: As specified herein.

C. System Accuracy Requirements

1. The accuracy requirements established in this Section apply to the final data, including the composite effects of reflectors, readout instruments, measurement methods, temperature, operator variability, and other contributing factors.
2. All accuracies in this Section have an associated confidence level of 90 percent.
3. Reflectors installed on temporary or permanent structures (Structure Settlement Points):
   a. Within 0.01 foot vertical
   b. Within 0.01 foot horizontal
4. Optical monitoring lines: 0.01 foot perpendicular to the line.

2.03 TILTMETERS

A. Slope Indicator Co. Model 56802100 or approved equal.

B. Capable of monitoring rotations in one orthogonal direction with uniaxial tiltmeter, or two orthogonal directions if tandem pair of uniaxial tiltmeters together.

C. Measurement Requirements:

1. Resolution: ± 1 arc second
2. Range: ± 1 degree

D. Provide thermistors with installation

2.04 DATALOGGER

A. Capable of reading all sensors associated with instruments described in this Section.

B. Campbell Scientific Model CR1000 Datalogger or approved equal for monitoring multiple instruments.

C. Complete with input, output, signal conditioning, communications, and other hardware for a complete and functional system, including but not limited to:

1. Multiplexers

2. Local input/output connection for laptop computer

3. Telephone modem

D. Mount the datalogger in a protective enclosure as specified herein that will accommodate each manufacturer's enclosures for components of the system.

E. Provide mounting posts, concrete, and other materials / equipment for the protective enclosure as required for complete, reliable, and durable system over the life of the Contract.

F. Provide a continuous, adequate power source free of voltage transient surges/sags for the datalogger in accordance with the manufacturer's recommendations.

2.05 INSTRUMENTATION DATA MANAGEMENT SYSTEM

A. Capable of comparing the output of each sensor, in engineering units, against user-selected alarm limits, and electronically relaying hourly logged readings to the Contractor's and Engineer's offices.

B. Capable of storing and disseminating all data from sensors associated with instruments described in this Section.

C. Automated processing of the instrumentation data to convert readings into meaningful engineering units.

D. Displays graphs of instrumentation data.

E. Generates reports of instrumentation data.

F. Access to the information is controlled.

G. iSite system by Geocomp, Argus system provided by Sinco, or approved equal.

2.06 PROTECTIVE ENCLOSURES

A. Provide protective enclosures with the following features, as indicated on the Contract Drawings:

1. Bolted lids.
2. Painted or otherwise protected from weather, and waterproof to prevent the ingress of water into the enclosure.
3. With flanges, brackets, or other equipment appropriate for the associated type of mounting. Weld or otherwise attach mounting equipment to the enclosure and do not penetrate the protective enclosure (i.e. no bolt holes).
4. A minimum of 3-inch clearance all around the enclosed instrument, or as indicated on the Contract Drawings, or as specified for specific instruments.

B. Ensure conduit for signal cable penetrates the wall of the enclosure using standard fittings to provide continuous protection for the cable.

C. Ensure signal cables not enclosed in conduit penetrate the wall of the enclosure through standard weather-proof flexible compression (grommet) fittings.

D. For enclosures subjected to vehicular traffic, mount the enclosure flush with the ground surface, and design for H-20 AASHTO loading.

2.07 AUTOMATED TOTAL STATION

A. Automated Total Station

1. Leica Model TM30 or approved equal.
2. Measurement Requirements:
   a. Range: 250 feet minimum
   b. Accuracy: 2 mm
3. System Reporting: Readings from the designated Structure Settlement Points shown on the Drawings shall be reported to the Instrumentation Data Management System.
4. Ancillary equipment: Parts needed for a complete and functional system.
5. Protective Enclosures: As specified herein.

PART 3 – EXECUTION

3.01 EXECUTION- GENERAL

A. Install settlement points and geotechnical instrumentation as indicated and as close as practicable to the locations indicated on the Plans. Adjust for the actual conditions in the field.

B. Exact locations of settlement points and geotechnical instrumentation shall be field-determined and shall be approved by the Engineer prior to installation.

C. Verify location of buried utilities before installation of instrumentation.

D. Install access covers to protect installed settlement points as identified on the Drawings.

E. Provide as-builts and surveyed location of each instrument within five days of installation.

3.02 INSTRUMENT INSTALLATION

A. Unless otherwise specified, install all instruments in accordance with the manufacturer's recommendations and requirements. Manufacturer's recommendations are included as a part of these Specifications by reference, and are applicable, regardless of whether a particular recommendation is explicitly stated in this Section or not.

B. Structure settlement monitoring points:

1. Locate structure settlement monitoring points to minimize damage to façade and facilitate repair after removal.
2. Any other chipping shall be filled with epoxy grout, as approved by the Engineer, so that no depression is evident beyond the shoulders of the monitoring point.

C. Tiltmeters:

1. Install tiltmeters in accordance with the manufacturer's recommendations, and in locations as shown on Plans.

D. Automated Total Station

1. Install automated total station in accordance with the manufacturer's recommendations.
2. Install protective enclosures to prevent theft, tampering, and damage to the automated total station.
3. Install reference survey targets outside of the project area so that the automated total station can periodically re-calibrate its position.
4. Install and route any necessary power or data cables in such a manner so that they will not be damaged by construction activities or vehicular traffic.

E. Portable readout units may be used for testing instrument function prior to connection with datalogger, and at other times as necessary. However, implement fully automated (datalogger) reading function prior to the start of construction of the associated remediation excavation.

E. Geotechnical monitoring equipment shall not create damage to the School or Teacherage structures. Any damage to School or Teacherage building structures will be repaired to original conditions as determined by the pre-construction video survey, as approved by the Department of Archaeology and Historic Preservation, RCW 1927.120, and as approved by the Engineer.

F. Verify baseline readings agree to within the accuracy of the instrument.

3.03 PROTECTION AND MAINTENANCE

A. Keep protective access covers in place at all times other than during manual monitoring and maintenance.

B. Maintenance of instruments to be performed monthly:

1. Keep access cover enclosures free of water.
2. Clean electrical connections and reference head attachment.
3. Check and test circuitry and power supply.
4. Check datalogger for operation.

C. Replacement settlement points shall be available within 24 hours for repair and replacement of existing installed settlement points.

D. Replacement instruments, components, and readout units shall be available within 24 hours for repair and replacement of existing installed instrumentation.

E. Repair or replace damaged or missing instrument components or entire instruments as required for operation within 48 hours of detection of damage where re-installation is required or within 24 hours of detection where readily accessible parts are to be replaced or repaired.

F. Repair or replace damaged or missing settlement points as required for operation within 24 hours of detection of damage.

G. In the event of noted abnormal monitoring data or instrument damage, repair or replace the affected instrument or components within 48 hours of detection.

3.04 INSTRUMENTATION MONITORING

A. Monitor and report all settlement points and geotechnical instruments as indicated on the Drawings.

B. Make initial readings on all settlement points and monitoring instruments:

1. Three complete sets of baseline measurements and readings shall be taken at all of the settlement points and instrumentation indicated on the Drawings.
2. Baseline readings shall be comparable and equal within the rated instrument accuracy.

C. Readings on all instruments shall be as indicated on the Drawings; frequency of readings shall increase where Action Levels are reached as described herein or as directed by the Engineer.

D. Action Levels are as indicated on the Drawings.

E. Instrument calibration:

1. Calibrate all instruments prior to installation.
2. The instrumentation systems shall at all times during the monitoring program meet the manufacturer's minimum calibration requirements.
3. Recalibrate survey instruments, readout units, and other equipment that is used for monitoring on an on-going basis at the manufacturer's recommended intervals, or whenever, in the opinion of the Engineer or the Contractor, there is reason to suspect that the associated data is being affected by calibration changes or errors.
4. Perform all calibration in accordance with the instrument manufacturer's recommended methods.
5. Correlate readings from any new replacement instrumentation with the previously acceptable data:
   a. Develop continuous plots of instrumentation data using an arrow and note indicating the date of replacement on each instrument plot and data table within the database.
6. Instrument and settlement points shall be measured relative to survey bench marks.

3.05 INSTRUMENTATION MONITORING LIMITS AND ACTION LEVELS

A. Conduct all work in a manner such that ground movement and settlements do not exceed the maximum allowable limits indicated on the Drawings.

B. Conduct all work in a manner such that ground heave movement does not exceed one inch.

C. Action Levels:

1. Trigger Level for each settlement point and geotechnical instrument as indicated on the Drawings:
   a. Identify the cause of movement.
   b. Implement the Corrective Action Plan within two hours of trigger level exceedance or notification.
   c. Make modifications to construction procedures and means and methods as required by corrective actions:
      1) For settlement: Adjust excavation parameters and operation measures and reduce progress rates as required to reduce settlement reoccurrence.
      2) For heave: Adjust excavation parameters as required to prevent additional heave and mitigate future occurrence of heave.
   d. Notify the Engineer in writing of the level of movement and settlement and the corrective actions being taken.

e. Increase the frequency of settlement point monitoring by two until the relative incremental change of movement has returned to the pre-action trigger level rate of change, as determined by the Engineer.

2. Maximum Allowable Limit
   a. Make immediate operational changes to mode of excavation. This may require stoppage of construction activity.
   b. Coordinate with the Engineer to develop a plan of modified corrective measures to be carried out as a means to proceed with construction operations to reduce the risk of additional excessive ground movement.
   c. Coordinate corrective measures with the Engineer.

3.06 REMOVAL OF GEOTECHNICAL INSTRUMENTATION

A. The timing of the removal of settlement points and geotechnical instrumentation shall be following the completion of monitoring and as approved by the Engineer.

B. Restore disturbed or damaged surfaces to the conditions existing before installation of any instrumentation or settlement points.

END OF SECTION 02150

BNSF – Skykomish School HWF Remediation

SECTION 02220

DEMOLITION

PART 1 – GENERAL

1.01 SECTION INCLUDES:

A. Summary
B. Submittals
C. Quality Control
D. Demolition-General
E. Coordination and Scheduling
F. Excavation Stability
G. Abatement
H. Execution – General
I. Preparation
J. Interior Demolition
K. Excavation and Removal of Soil and Impacted Material
L. Removal of Surface Structures
M. Removal of Subsurface Structures and Piping
N. Material Handling and Disposal

1.02 SUMMARY:

A. Section Includes:

1. Demolition of surface and subsurface structures as shown on the Plans. The structures shall include, but are not limited to, asphalt pavement, sidewalk, curb and gutter, street light bases, concrete slabs, existing storm pipe and catch basins, sewer lines, water lines, and other utility appurtenances.

B. Related Sections:

1. Section 01150 – Health and Safety Requirements
2. Section 01500 – Temporary Facilities
3. Section 01575 – Temporary Erosion and Sediment Control
4. Section 02110 – Excavation and Stockpiling
6. Section 02120 – Transportation of Construction Debris, Impacted Decontamination Water, and Non-hazardous Materials

1.03 SUBMITTALS:

A. As part of the Technical Execution Plan, the Contractor shall describe the sequence for the removal of the surface and subsurface structures.

B. The Contractor shall submit weight tickets as specified in Section 02120- Transportation of Construction Debris, Impacted Decontamination Water, and Non-hazardous Materials.

1.04 QUALITY CONTROL:

A. The Contractor shall conform to the Contractor's Site-Specific Health and Safety Plan (HASP), including adherence to all applicable local, state, and federal health and safety standards and guidelines as specified in Section 01150.

B. The Contractor shall conform to the requirements for site controls specified in Section-01580- Environmental Control for odor and dust control, during surface and subsurface structure removal as well as the excavation operation.

1.05 DEMOLITION - GENERAL:

A. Contractor shall demolish all features shown on the Plans.

B. The Contractor shall protect existing utilities, and other unmarked facilities, from damage during surface and subsurface structure removal work.

C. The approximate locations and dimensions of structures to be removed are indicated on the Plans.

D. Surface and subsurface structure removal work involves handling materials containing substances that may be harmful to the health and safety of Project remediation workers. The Contractor shall perform all Project remediation work in full compliance with the HASP and Section 01150 - Health and Safety Requirements. Failure to do so will trigger removal mechanisms for the health and safety of Project personnel.

E. The Contractor shall protect School and Teacherage building structures. Any damage to School or Teacherage building structures will be repaired to original conditions as determined by the pre-construction video survey, as approved by the Department of Archaeology and Historic Preservation, RCW 1927.120, and as approved by the Engineer.

1.06 COORDINATION AND SCHEDULING:

A. Surface and subsurface structure removal work shall be coordinated with excavation activities.

1.07 EXCAVATION STABILITY:

A. The Contractor shall be completely responsible for maintaining the stability of excavation slopes during demolition operations.

1.08 ABATEMENT

A. The Contractor shall perform abatement of the School interior, prior to interior demolition, as needed to provide a safe worker environment. The abatement shall include hazardous building materials in the area of work as described in the *Limited Hazardous Materials Survey Report, Skykomish School First Floor (Ground/Basement) 105 6th Street Skykomish, WA 98288* prepared November 2009, by EMR, Inc. for Farallon Consulting, LLC on behalf of BNSF, provided in Appendix B of these specifications.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 PREPARATION:

A. Where feasible, the Contractor shall remove fluids and impacted material from intact surface and subsurface structures prior to the demolition and removal operation.

B. Demolish and remove the structures in accordance with the Plans.

C. Construct and maintain barriers around subsurface structures and provide other necessary public and worker safety measures prior to leaving the site each day as required by regulation and specified in Section 01500 - Temporary Facilities.

3.02 INTERIOR DEMOLITION:

A. The Contractor shall control interior dust and debris associated with demolition by protecting air ducts and undisturbed areas with plastic sheet partitioning.

B. The Contractor shall photo document pre-demolition and post-demolition conditions. Time stamped

3.03 EXCAVATION AND REMOVAL OF SOIL AND IMPACTED MATERIALS:

A. Removal of impacted soil and water from inside the structures shall be included in the surface and subsurface structure removal work.

B. Excavate and remove soil and water from within the structures as directed by the Engineer and in accordance with the procedures outlined in Section 02110 - Excavation and Stockpiling.

3.04 REMOVAL OF SURFACE STRUCTURES:

A. Demolish each structure designated for removal, including cement concrete sidewalk, cement concrete curb and gutter, cement concrete driveway slabs, patio concrete, concrete steps, concrete street light bases, fencing including posts and post concrete, and haul to the disposal stockpile. Soil and vegetation adhering to the above concrete shall be brushed-off on-site and hauled to the impacted material stockpile area for disposal. Landscaping and other features on private and Town properties may be retained and salvaged for reuse, as designated by the Engineer.

B. Clear and remove all existing foundations, porches, side walks, patios, driveways, landscaping after the structures are moved from their original locations to the temporary storage area.

C. The Contractor shall break up all debris so that pieces are of an acceptable size for disposal at the Construction Debris Landfill (CDL) chosen by the Contractor and approved by the Engineer. Acceptable steel may be recycled at a previously approved metal recycling facility.

D. The Contractor shall permit and assist the Engineer or the Engineer's agents, to inspect portions of the concrete structures that have been in contact with the ground in order to determine limits of contamination. Should evidence of contamination be identified by the Engineer, the Contractor shall place the broken concrete and other debris in the impacted

material stockpile for loading and disposal in accordance with Section 02110 - Excavation and Stockpiling.

E. The Contractor shall remove all playground structures identified by the Engineer as designated for removal. Playground structures shall be hauled to the disposal stockpile for loading and disposal at a facility chosen by the Contractor and approved by the Engineer.

3.04 REMOVAL OF SUBSURFACE STRUCTURES AND PIPING

A. Subsurface structures may consist of items shown on the Plans and any unidentified piping during the course of the work. Contractor shall note that oil tanks and other tanks are shown on the plans where they are now. An unforeseen obstruction that cannot be removed with standard excavating equipment shall be removed on a Time and Materials basis by the Contractor upon receiving prior approval of the Engineer.

B. The Contractor shall immediately notify the Engineer when an unidentified or unknown subsurface structure is encountered during the excavation operation. The Engineer will direct the Contractor of the acceptable method of removal and disposal of the unidentified, unknown structure or piping based on visual observation or testing. The Engineer may direct the Contractor to stockpile the unidentified material until testing results become available to determine the ultimate disposal requirement. This work will be completed on a time and materials basis by the Contractor upon receiving prior approval of the Engineer.

C. Contractor shall alert the Engineer of any unforeseen drums or underground storage tanks (UST) encountered to allow the Engineer to make an assessment of the contents. The Contractor shall stockpile the impacted soil and water removed from these drums and USTs in accordance with Section 02110- Excavation and Stockpiling.

D. The Contractor shall crush the emptied drums and containers and place them in the impacted material stockpile for loading and disposal in accordance with Section 02110- Excavation and Stockpiling. The Contractor shall break up the metal tank into pieces that are of an acceptable size for the steel salvage yard or Construction Debris Landfill chosen by the Contractor for disposal.

3.05 MATERIALS HANDLING AND DISPOSAL:

A. Transportation and haul for disposal of non-impacted demolition debris, fluids encountered during demolition, and impacted materials shall be as specified in Section 02120 − Transportation of Construction Debris, Impacted Decontamination Water and Non-Hazardous Materials.

B. Demolition debris shall be temporarily stored on-site in a stockpile separate from other excavated materials by the Contractor within areas approved by the Engineer. If the Engineer determines by measurement and testing that the stockpiled demolition material is impacted, the Contractor shall stockpile the demolition debris with the excavated impacted materials for disposal. If the Engineer determines the demolition debris to be non-impacted, the Contractor shall haul the debris off-site for disposal at the CDL as specified in Section 02120 − Transportation of Construction Debris, Impacted Decontamination Water, and Non-Hazardous Materials.

C. Landscaping debris, sod, and soil from exterior demolition not suitable for re-use on site shall be disposed of at a commercial recycling facility or landfill permitted to receive this material and as approved by the Engineer.

D. Liquid Wastes

1. Fluids from intact surface and subsurface structures, 55-gallon drums, and other metal tanks shall be collected and stored in storage tanks in accordance with Section 02110 − Excavation and Handling of Non-Impacted and Impacted Materials.
2. Upon receiving the Engineer's prior approval, the Contractor shall ship fluids to a previously approved off-site water management facility as specified in Section 02120 − Transportation of Construction Debris, Impacted Decontamination Water, and Non-Hazardous Materials.
3. The Contractor shall be responsible for sampling and analysis of fluids as required for off-site facility acceptance. The Contractor shall provide a copy of the analytical results to the Engineer in addition to disposal facility tickets.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02230

SITE CLEARING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Quality Control
C. Tree Clearing
D. Clearing and Grubbing of Grass and Other Vegetation
E. Stockpiling and Disposal of Cleared and Grubbed Vegetation

1.02 SUMMARY

A. The Contractor shall provide all necessary labor, materials, and equipment for clearing vegetation and trees on the remediation site and within the Project area to facilitate the construction activities as described in these Specifications and Plans.

B. Related Sections

1. Section 02110 – Excavation and Stockpiling

2. Section 01575 – Temporary Erosion and Sediment Controls

3. Section 02120 – Transportation of Construction Debris, Impacted Decontamination Water, and Non-hazardous Materials

4. Section 02220 – Demolition

1.03 QUALITY CONTROL

A. The Contractor shall perform site clearing in a manner that does not disturb existing structures, utilities, monitoring wells, or other facilities not indicated to be removed.

B. The Contractor shall minimize disturbance of soils outside the limits scheduled for remediation as indicated on the Plans. The Contractor shall decontaminate equipment that comes in contact with impacted materials in accordance with section 02130-Decontamination.

C. The site clearing operation includes handling impacted material. All personnel performing site clearing work must have the requisite training and medical monitoring for handling waste materials in accordance with 29 CFR 1910.120 and Section 01150.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01. TREE CLEARING

A. The Engineer will conduct a pre-clearing survey to mark trees designated for removal.

B. The Contractor shall remove designated trees from within the limits of the Project. Tree removal shall include removal of the aboveground tree portion and belowground tree rootball.

C. Shrubs, trees, and vegetation designated for removal shall be cut at the ground surface. That aboveground portion shall then be removed as non-impacted material. In general, the portion below the ground surface shall be treated as non-impacted material unless the root structure is comingled with impacted material. Root structures shall be disposed of as impacted material where they are determined to be comingled with impacted material.

3.02. CLEARING AND GRUBBING OF GRASS AND OTHER VEGETATION

A. The Contractor shall remove shrubs, brush, grass, and other vegetative material for disposal as non-impacted material unless root structures are comingled with impacted material. Shrubs, brush, grass, and other vegetative material shall be disposed of as impacted if determined to be comingled with impacted material.

3.03 STOCKPILING AND DISPOSAL OF CLEARED AND GRUBBED VEGETATION

A. Removed vegetation shall be disposed of at an approved recycling landfill.

B. Burning of cleared vegetation will not be permitted.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02250

OIL RECOVERY IN EXCAVATION AREA

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Submittals
C. Oil Recovery Equipment
D. Oil Recovery – General
E. Quality Control

1.02 SUMMARY

A. This Section describes the free product containment and recovery and the separation of free product oil and water in the excavation area. As a point of reference in preparation for the work described in this section, previous experience for this project indicates that collection of thick, viscous bunker oil could be necessary to allow backfilling operations.

B. Related Sections

1. Section 01500 – Temporary Facilities

2. Section 02110 – Excavation and Stockpiling

3. Section 02120 – Transportation of Construction Debris, Impacted Decontamination Water, and Non-hazardous Materials

4. Section 02310 – Backfilling and Grading.

1.03 SUBMITTALS

A. The Contractor shall designate an Oil Recovery Supervisor who will directly oversee oil collection in the field, document oil collection efforts and demonstrate compliance with this section. This person shall be familiar with specification of, operations of, and maintenance of oil collection equipment. This person, although they may have other duties on the site, shall be dedicated to the task of oil collection.

B. As part of the Technical Execution Plan, the Contractor shall provide an Oil Recovery Plan. The plan shall be submitted to the Engineer as specified in Section 01330 – Submittal Procedures and at least 30 calendar days prior to anticipated excavation work to allow for review and comment and adjustment of plan prior to start of Project excavation. The plan must at a minimum include:

1. The oil water separation method;

2. The method(s) of oil collection and storage during excavation;

3. The method(s) of oil control, collection and storage during backfilling;

4. Cleanup protocol should an inadvertent spillage occur.

PART 2 – PRODUCTS

2.01 OIL RECOVERY EQUIPMENT

A. The Contractor shall furnish, install and operate, and maintain in continuous good working order oil collection and recovery equipment of sufficient capacity to meet the requirements for the removal of oil in excavated areas.

B. All oil recovery equipment shall remain the property of Contractor and shall be removed from the Project site at the completion of the work.

PART 3 – EXECUTION

3.01 OIL RECOVERY – GENERAL

A. The Contractor shall furnish all labor, materials and equipment, and perform all operations required to maintain the oil recovery equipment and storage systems to collect, store, and dispose the oil recovered from the excavation area for off-site disposal. The Contractor shall prevent discharge of any oil or oily water onto the surface or street. The Contractor shall demobilize and decontaminate all oil recovery equipment and materials after completing the Work.

B. The Contractor shall set up site controls in order, as needed, to divert and collect oil from the excavation so that remediation activity is not interrupted.

C. The Contractor shall install, operate, and remove the oil recovery systems in accordance with applicable federal, state, county laws, ordinances, and regulations as well as accepted industry standards.

D. Oil released during the excavation shall not be allowed to contaminate non-impacted soil. Clean backfill must be protected from being contaminated with oil using booms, absorbant pads, water jets, pom pom booms, or similar equipment. No backfilling is allowed in areas where free oil is floating on the water surface.

E. Oil removal equipment shall minimize the amount of water that is removed with the oil.

3.02 QUALITY CONTROL

A. The Contractor shall establish, maintain, and document oil recovery methods and removal quantities. Quality control documentation by the Contractor is required to assure compliance with regulatory requirements and reporting procedures. Oil recovery performance shall meet the following requirements:

1. All the oil produced by the excavation activities during a shift shall be removed from the free water surface that day.

2. Backfill material may not be placed through oil.

END OF SECTION

BNSF – Skykomish School HFW Remediation

SECTION 02280

PERMEATION GROUTING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Quality Assurance
C. Definitions
D. Submittals
E. Design Approach
F. Delivery, Storage, and Handling
G. Project Conditions
H. Materials
I. Equipment
J. Mixes
K. Execution-General
L. Grout Holes
M. General Grouting Requirements
N. End of Grouting Operations Report
O. Record Document Drawings

1.01 SUMMARY

A. This Section specifies furnishing all materials, equipment, and labor, and performing all work required for the limited permeation grouting for the Skykomish School Remediation Project.

B. The purpose of the permeation grouting is to create a low permeable groundwater barrier between the sheet pile wall and existing MSE wall along the north side of the school building where the sheetpiles abut the existing buried wall. See sheet C-103 Sheet Pile Wall Layout Plan for a general sketch of the grouting layout which will be modified depending on field conditions.

C. Related Sections:

1. Section 01330- Submittal Procedures

2. Section 02464- Sheet Piling

1.02 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. It is a part of this Section as specified and modified. In case of a conflict between the requirements of this Section and those of a listed document, the requirements of this Section shall prevail.

Reference	Title
ASTM D422	Gradation Testing of Soils
ASTM C31	Test Methods of Making and Curing Concrete Test Specimens in the Field

ASTM C94	Specification for Ready-Mixed Concrete
ASTM C109	Test Method for Compressive Strength of Hydraulic Cement Mortars
ASTM C150	Specification for Portland Cement
ASTM C494	Specification for Chemical Admixtures for Concrete
ASTM D1633	Standard Test Method for Compressive Strength of Molded Soil-Cement Cylinders
ASTM D2850	Standard Test Method for Unconsolidated, Undrained Compressive, Strength of Cohesive Soils in Triaxial Compression
ASTM D4832	Standard Test Method for Preparation and Testing of Soil-Cement Slurry Test Cylinders
ACI 201.2R	Guide to Durable Concrete
API Std. 13A	Specification for Drilling-Fluid Materials
API Std. 13B	Standard Procedure for Testing Drilling Fluids

B. Qualifications:

1. Permeation Grouting Firm: No fewer than five projects completed within the last 10 years each, including the planning and execution of a permeation grouting program that was similar in scope and type to that required for this Contract.
2. Grouting Manager: Full-time, on-site individual with duties limited to responsible charge for all grouting operations. A minimum of five years of experience in the design and field application of the methods utilized to perform the work planned for this Contract.
3. Superintendent, foreman, and crew must have demonstrable experience in performing permeation grouting similar to the type required for this Contract.

1.03 DEFINITIONS

A. Grout: Mixture of cement/flyash, sand, and water with the possible addition of fluidifer additives, and/or set additives. Actual combinations will be as specified or approved by the Engineer.

B. Grouting: General term referring to the injection of cement, water, bentonite, sodium silicate, or other materials designed to perform ground improvement.

C. Permeation Grouting: A method of ground treatment to reduce the permeability and improve stability of soils using cement or chemical grouts to fill soil pore spaces without causing fracturing or excessive movement of the ground.

D. Primary Holes: Primary holes are the initial grout holes, which should be drilled to create a cut-off wall between the existing MSE wall and installed sheet pile wall. Primary holes will be drilled in a perimeter pattern on either side (in an arc on inside and outside of gap) of the connection of the MSE wall and sheet pile wall.

E. Secondary Holes/Grout Test Holes: Grout test holes are grout holes that are drilled and grouted following completion of grouting in the primary holes. A

casing/sleeve-port grout pipe with grout ports at regular intervals is installed in the grout test holes and a double packer that isolates a single interval of grout ports is used for grouting these holes. The grout test holes are usually located within the perimeter pattern of the primary holes, but may be located at other locations where indicated by the Engineer. The injection pressures for Secondary Holes are greater than in Primary Holes. Grout pressures and grout take observed in the Secondary Holes will be used to evaluate the effectiveness of the grouting in the Primary Holes.

1.04 SUBMITTALS

A. Procedures: Section 01330 - Submittal Procedures.

B. Qualifications: Shall be submitted for approval 14 days before the proposed start of the grouting work.

C. Grouting Plan:
1. Submit 7 days before starting grouting work: written descriptions, shop drawings, and material certifications for all equipment and materials listed in Part 2 of this Section.
2. Proposed sequence of operations, including drilling and grouting by hole number.
3. Proposed equipment, including staging requirements.

D. Mix Designs:
1. Mix designs for each proposed grout mix shall be submitted 7 days before starting grouting operations. The proposed mix design shall include:
    a. Total gallons of water per cubic yard of mix.
    b. Brand, type, composition, and quantity of cement.
    c. Brand, type, composition, and quantity of flyash.
    d. Brand, type, ASTM designation, active chemical ingredients, and quantity of each admixture, if used.
    e. Source, type, gradation, and quantity of sand used.
    f. Test results to verify sedimentation, viscosity, density, slump, and compressive strength.
    g. Water-cement ratio.

E. Record document drawings indicating area and components of the grouting program.

1.05 DESIGN APPROACH

A. Areas for permeation grouting will be identified by the Engineer during construction. The width of the gaps could be a wide as the width of one sheetpile.

B. The work required herein relies substantially on Contractor means and methods for performing permeation grouting. The Contractor grouting plan may augment and enhance the minimum design criteria specified herein as required to meet the design and performance criteria.

C. Perform permeation grouting:

1. Hole spacing: 1 foot maximum or as approved by the Engineer.
2. Maximum injection pressure: 50 percent of overburden pressure plus 100 percent of existing hydrostatic pressure unless otherwise determined or approved by the Engineer.
3. Secondary Holes shall generally be placed within the pattern of Primary Holes.
4. Multiple rows of Primary and/or Secondary Holes may be used.
5. Measure and record grout take and pressures on all holes.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials at such times as will avoid delay.

B. Grout materials shall be stored in a dry place and used within 6 months of its manufacture. Broken packages and packages subjected to moisture shall be wasted at the Contractor's expense.

C. To prevent any undue aging of sack cement or grout after delivery, the Contractor shall use sacked cement or grout in the chronological order in which it is delivered to the site. Each shipment of cement or grout shall be stored so that it may readily be distinguished from other shipments.

D. Special Storage: The temperature of bulk materials, cement, aggregate, and water shall be at least 40°F prior to batching. Cold weather conditions will require special storage arrangements to maintain temperatures.

1.07 PROJECT CONDITIONS

A. Health and Safety:

1. Alkali hydroxides and other chemicals contained in grout admixtures are moderately toxic and can cause skin and respiratory irritation. Take adequate safety measures to prevent injury to personnel.
2. Maintain safety in accordance with governing OSHA regulations in all areas where grout is to be installed. Causticity of cement and accelerating hardening admixtures may cause skin and respiratory irritation unless safety measures are implemented and proper ventilation provided.

B. Interpretation of Conditions: The Contractor shall make his own interpretation of conditions that may affect methods, cost, and/or safety of execution of the work.

C. Water Control: The Contractor shall comply with all erosion and sedimentation control requirements required either by the Contract Documents and/or by the applicable regulations. Cleaning of pump hose and other equipment shall be only at locations that will comply with these requirements. The Engineer reserves the right to direct the Contractor to employ additional means to control any discharges or operations under this section.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Cement Grout:
   1. A mixture of Portland cement, water, and bentonite or other non-toxic, biodegradable admixtures if required.
   2. Mixed in a grout plant that combines dry cement and water in predetermined proportions.
   3. Consistency that is fluid and pumpable.
   4. Proportioned to provide the required strength and mixing consistency.

B. Type I or II Portland cement: ASTM C150.

C. Water: Fresh and potable water.

D. Flyash for Grout Mixes: Type C.

E. Admixtures shall be non-toxic and biodegradable and conform to ASTM C494.

2.02 EQUIPMENT

A. Drilling Equipment: All equipment used for drilling boreholes; lowering, raising, and rotating grout tubes; mixing grout; and injecting grout, shall have proven performance for use in performing grouting work. Equip the drilling equipment with protective guards, locks, clamps, and other standard safety devices as originally installed by manufacturer, or as required by OSHA.

B. For on-site batching, provide the necessary volumetric, dimensional, and weight measurement equipment necessary to perform the work and to accurately develop quantities for payment of contract bid items as approved by the Engineer. Such measurements and equipment shall be subject to the approval of the Engineer for use in this project.

C. Furnish the equipment used for mixing and injecting grout, and maintain equipment in a safe and efficient operating condition at all times. Design the equipment for grouting service, including the agitating, pumping, and injecting of grout mixes. Provide power, equipment and the layout that meets applicable requirements of Local, State, and Federal regulations and codes, both safety and otherwise.

D. Mixers: Grout mixers, holding tanks, and associated equipment shall be of a type and capacity for producing uniform grout mixtures at all times and in the quantities required for the timely execution of the work.

E. Grout Plant:
   1. Cement grout plant shall consist of a colloidal type mixer, agitated sump, grout pumps, gages, valves, pressure lines, and all other equipment necessary to mix and perform cement grouting as indicated and provide a continuous supply of grout and accurate control of the volume and pressure of grout being injected.
   2. Mechanically agitated sump or holdover tank with provisions for suitable screen to keep the mixed grout in suspension and remove hardened grout

or foreign material not passing a No. 16 US Standard Screen. Provide the holdover tank regardless of whether on-site mix or transit mix is utilized.

3. If batched on-site, provide equipment for accurately batching grout by weights or volumes. Provide equipment calibrations to Engineer.
4. A water meter shall be placed on the waterline to the grout mixer to permit accurate measurement of the quantity of water used in making the grout. Graduate the water meter in tenths of gallons or cubic feet.
5. Provide approved pressure gauges at the grout pump and on manifold hookup at collar of the hole being grouted.
6. All hose and/or metal pipe and fittings required for grouting, including those necessary for cutting, threading, fabricating, and placing. The minimum inside diameter of the grout supply pipe or hose shall be 1½ inches and contain full flow couplings that do not diminish the 1½ inch inside diameter continuity. Take necessary precautions to prevent any pipe from becoming clogged, in a manner satisfactory to the Engineer and at Contractor's expense.
7. Holdover tank with the pump, or a volume meter on each inflow line to a hole, or other arrangement acceptable to the Engineer suitable for measurement of the volume of grout to the nearest cubic foot being injected into each hole. Provide flow measurement equipment with a recent calibration and field-calibrate equipment periodically during project construction.
8. Pressure Gauges: Bourdon or any other suitable type with grout protection mechanisms and of such calibration as to cover a range of pressures from zero (0) psi to 100 psi. Provide an adequate number of spare gauges at each grout plant. Recalibrate gauges when Contractor or Engineer suspects they have been blocked or damaged, as directed by the Engineer.
9. Packers: Provide packers capable of sealing any specified interval in a casing in a drillhole and withstanding, without leakage, pressures up to and including 50 psi. The packer shall be approved by the engineer.
10. Grout plant shall have a grout supply line from the grout pump to the grout hole, and a return grout supply line from the hole to the agitator sump to permit constant operation of the pump under conditions of accurate pressure control and to prevent wastage of grout. Submit details of the equipment proposed for use.

F. Spare parts and equipment shall be available on site to maintain the grouting equipment in satisfactorily operating condition at all times during execution of the grouting work.

2.03 MIXES

A. Grout Mixes: Uniform and generally composed of a mixture of cement-flyash (flyash optional), sand, and water with possible addition of other admixtures.

B. Grout Mix Type 1:
   1. For use in Primary Grout Holes.
   2. Components: cement, sand, and water.

3. Mix: 1:1:½ (water: cement: sand ratio by loose volume, i.e., one cubic foot of water: one 94-lb bag of cement: one loose half-cubic foot of sand).
4. Average compressive strength: Not less than 2,000 psi at 28 days.

C. Grout Mix Type 2:
1. For use in Secondary/Grout Test Holes.
2. Mix: 1:1 (water: cement ratio, i.e. one cubic foot of water: one 94-lb bag of cement), or as directed by the Engineer.

PART 3 – EXECUTION

3.01 GENERAL

A. Develop and submit to the Engineer for approval a plan for the sequence of drilling and grouting holes. The Engineer reserves the right to add, change, move, or delete grout holes. The Contractor shall drill and grout additional holes as directed by the Engineer.

B. The grouting shall overlap the end of the sheetpiles and abut the existing fabric that covers the MSE block wall. The drilling shall not encounter the fabric covering the wall.

C. During grouting operations, the Contractor shall take precautions to control drill cuttings, oil, wastewater, and grout. Upon completion of daily grouting operations, the Contractor shall clean up waste resulting from operations to the satisfaction of the Engineer, and shall dispose of grout and slurry in accordance with all required state and federal regulations.

D. The Contractor shall protect any existing drainage structures from contamination or clogging by grout.

E. Perform grouting operations in the presence of the Engineer.

F. The Engineer may change the grout mix, pumping rates, and the sequence in which holes are grouted. The Engineer reserves the right to change or delete any of the grout mixes.

G. The Engineer reserves the right to request a test program to verify the maximum pressures that can be used before ground surface heave occurs, and to determine maximum injection pressures. The Contractor will be paid for the test program per unit costs in the same manner as for production grouting and as specified previously in this Section.

H. Drilling and grouting depth shall be measured with respect to ground surface by observing the length of the rods inserted.

1. Markings shall be located on the drill mast in one-foot increments to assist the drill operator in determining the exact depth.
2. Grout column length shall be measured by observing the length of the rods withdrawn while grouting.

3.02 GROUT HOLES

A. Drill primary grout holes, minimum 2-inch diameter, in an arc pattern and pump in enough grout material so that a continuous column is formed that overlaps the adjacent grout columns.

B. Drill secondary grout holes at the locations within the two arcs so that the grout material overlaps and is in between the primary holes.

C. Conduct drilling in such a manner and with suitable equipment so that the holes stay open for grouting after drilling.

D. Wait a minimum of 24 hours after grouting primary holes before drilling and grouting secondary grout holes.

E. Replace lost or plugged grout holes due to mechanical failure of pumping or batching equipment or inadequacy of grout supply at no cost to the Owner.

F. For Secondary Holes, use a double packer to inject Grout Mix Type 2 into the selected zones through alternate ports in the sleeve pipes. Temporary high injection pressures not exceeding one minute in duration will be permitted to crack open sleeve-ports.

3.03 GENERAL GROUTING REQUIREMENTS

A. Set grout packers so that grout flows freely into the hole.

B. Avoid clogging or obstructing packers before grout hookups are made. Clean clogged or obstructed packers before grouting.

C. Make hose connections so as to prevent leakage.

D. Provide a straightway cock or valve at each connection.

E. Provide a packer at the hole collar to prevent leakage.

F. During grouting, the Contractor shall monitor the rate of grout take during grout injection. The Contractor shall ascertain the cause of sudden drops in grout injection pressures following initial start-up pressure adjustments and continuously monitor surrounding areas and utilities for grout leakage. In the event that grout leaks are observed, temporarily terminate injection and plug leaks before resuming grouting.

G. Arrange the grouting equipment to provide a continuous circulation of grout throughout the system and to permit accurate pressure control by operation of a valve on the grout return line, regardless of how small the grout take may be.

H. Prevent the equipment and lines from becoming fouled by the constant circulation of grout back to the pump (return line) and by the periodic flushing out of the system with water. Flush with the grout intake valve closed, with water supply valve open, and the pump running at full speed.

I. Stop or discontinue grouting if ambient temperature drops below 30°F or utilize heated mix water and grout materials to keep grout temperatures above 40°F.

J. If refusal is reached, the Engineer may direct the increase of the injection pressure in 5 psi increments to increase the grout take.

K. If the grout take drops steadily and the Contractor believes refusal is being approached, continue pumping until the refusal criteria is reached.

L. Mix grouts for a minimum of 2 minutes before injection. Agitate grout continuously to prevent settling or sedimentation between the time of mixing and injection. Waste grout that cannot be injected within 2 hours of mixing.

3.04 END OF GROUTING OPERATIONS REPORT

A. Keep neat and systematic grouting records as the work progresses. As a minimum, records should include the following:

1. Hole number/location.
2. Grout hole geometry, including diameter, spacing, depth, and casing details.
3. Grout quantities in each hole.
4. Injection pressure and variations.
5. Grout mixes and variations thereof.
6. Slump, temperature, sedimentation, density, and Marsh funnel results of grout mixes used.
7. Total grout quantity per day and cumulative total installed to date per hole.
8. Accurate documentation of all pay item quantities, e.g., delivery slips, weigh tickets.
9. Number and classification of labor and equipment used.
10. Nature, causes, duration, and impacts from interruptions and delays during the shift.
11. Ground heave.

3.05 RECORD DOCUMENT DRAWINGS

A. Include a sketch of Grout Holes. Drawings to be at maximum scale of 1 inch equals 10 feet.

B. Submit mark-up drawings within 30 days of completion of work at each location of ground improvement.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02310

BACKFILLING AND GRADING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. References
C. Submittals
D. Project Conditions
E. Field Quality Control
F. Preparation
G. Placement of Backfill
H. Certification of Backfill
I. Site Grading and Restoration
J. Maintenance

1.02 SUMMARY

A. This Section includes placement and compaction of backfill in excavations and final grading for Site restoration.

B. Related Sections:

1. Section 01575 – Temporary Erosion and Sediment Control
2. Section 01722 – Construction Surveying
3. Section 02060 – Aggregate Materials
4. Section 02110 – Excavation and Stockpiling

1.03 REFERENCES

A. WSDOT Standard Specifications, 2008, Divisions 2 and 7.

B. King County Road Standards, 2007

1.04 SUBMITTALS

A. Submit the compaction test reports within 24 hours of taking the tests as outlined below.

B. Submit as-built topographic survey map of completed backfilling and grading as specified. Submit as-built survey within fourteen (14) calendar days after completion of all Site grading and restoration work.

C. Within one (1) day after the imported backfill materials are delivered and placed for the Project, the Contractor shall submit documentation of the imported backfill materials, including the backfill ticket for each truck load of material from a commercial borrow source with certified scales and certified scalemaster stamped weight ticket. The ticket shall bear the stamp and name of the certified scalemaster and date, driver name, truck number, tare, gross, and net weight, and item number of the material delivered. The Contractor shall submit the original tickets to the Engineer. Unsigned scale weight or tickets without the certified scalemaster stamp will be rejected and no compensation

will be made for material without proper documentation. Prior to any delivery of backfill materials to the site, the Contractor shall submit copies of recent scale certification and of the scalemaster certification from each source intended for this Project.

1.05 PROJECT CONDITIONS

A. Work shall be performed in a manner that does not harm existing utilities, structures, or other facilities that are not indicated to be removed within the project limits.

B. Work shall be coordinated with excavation and confirmation sampling before commencement of backfilling.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 FIELD QUALITY CONTROL

A. The Contractor shall retain the services of a licensed material testing firm to verify and control backfilling operations so that the backfill meets the requirements in these Specifications. Field density testing shall be completed at the rate determined by the testing firm in order to ensure that the backfill is placed in accordance with the Specification, but at the minimum, the Contractor shall perform three (3) tests per lift for every 4000 square feet of backfill material placed in the remediation area.

The Contractor shall submit the testing results to the Engineer within 24 hours of taking the tests, including any re-tests for areas that failed the compaction criteria.

B. Surveying shall be performed to record the final surface elevation of completed backfilling and grading as specified in Section 01722−Construction Surveying.

3.02 PREPARATION

A. Backfilling of excavation shall not proceed until Engineer has approved the completion of excavation in each area of the Project. The Engineer will provide written approval to the Contractor for backfilling the excavation areas.

3.03 PLACEMENT OF BACKFILL

A. Areas where remediation has been completed, as determined by Engineer, shall be backfilled as specified in the following paragraphs.

B. Backfill Vertical Delineation Limit (VDL). A Backfill VDL is shown on the Plans to approximate the delineation between the compacted backfill materials below the standing water, and the compacted backfill materials above the standing water. The Backfill VDL shown on the Plans is set at the mean water elevation for June to September. Should standing water elevations vary substantially from the Backfill VDL shown on the Plans, the Contractor may request a VDL adjustment for approval by the Engineer. The VDL adjustment must be made at the start of backfill activities and shall

not be changed once backfill operations begin. The VDL is intended to simplify measurement and payment and to eliminate the need for interim surveying. The Contractor should recognize that at times backfill operations below the VDL may take place in the dry and therefore will require appropriate compaction; conversely, backfill above the VDL may take place in standing water requiring the appropriate placement and handling techniques. Should these conditions occur, no change will be made in measurement and payment as these conditions should amount to a small percentage of the overall volume for payment at the specified bid unit rate. All material placed above the Backfill VDL will be paid for at the above-VDL bid unit rate and all material placed below the Backfill VDL will be paid for at the below-VDL bid unit rate regardless of the actual standing water elevation at the time of placement.

C. Backfill shall be placed in uniform horizontal layers not exceeding 10 inches loose lift thickness and compacted using appropriately sized equipment specifically designed for compaction to the requirements specified herein.

D. Backfill placed in the remediation area shall be conducted as follows:

1. Backfill placed within the remediation area below standing water at the time of backfilling shall be Stabilization Aggregate Material as specified in Section 02060− Aggregate Materials, or as otherwise directed by the Engineer. The fill shall be placed in lifts no thicker than two (2) feet and compacted to the maximum extent practical by using the bucket of the excavator. Every attempt shall be made by the Contractor to level the fill out below water and, using the excavator bucket, compact the fill in place. Once the fill level extends above the water surface, the Contractor shall compact the exposed fill surface of the stabilization material with a vibratory roller with a minimum operating weight of 15 tons until the surface of the stabilization material is firm and non-yielding. Structural fill can be placed over the surface once this performance is achieved.

2. Backfill placed in all areas above the water table (above the Backfill VDL) shall be Structural Fill or clean overburden placed in maximum loose lifts of one foot and compacted to the following:

    a. At least 95 percent maximum dry density as determined by ASTM D-1557. Moisture conditioning may need to be added to clean overburden material to achieve the density requirements.

E. Overburden material excavated from the Site that the Engineer approves for re-use may be placed and compacted to the required standard above the Backfill VDL to ground surface.

F. The Contractor shall retain and provide the services of a licensed certified material testing firm, pre-approved by the Engineer, to verify and document the backfilling operation as meeting the requirements in this Section.

G. Field density testing shall be completed at the rate determined by the Contractor's testing firm in order to ensure that the backfill is placed in accordance with the requirements, but at a minimum, the Contractor shall perform the number of tests prescribed in this specification. The Contractor shall submit the testing results in written format to the Engineer within 24 hours of taking the tests, including any re-tests for areas that failed the compaction criteria.

H. Place and compact backfill into the excavations up to final grade shown on the Plans. In the roadway prism, backfill to the base of the Roadway Typical Section and complete the Section in accordance with the Roadway Typical Section.

I. Upon completion of backfilling operation and the construction of the roadway, the Contractor's material testing firm shall submit a statement certifying by a Professional Engineer registered in the state of Washington that the construction was completed in compliance with these Specifications.

J. Surveying shall be performed to record the final surface elevation of completed backfilling and grading.

K. At the completion of the Project, provide an As-Built/Record Drawing topographic survey map completed to a one-foot contour interval to Engineer for review for approval. The survey map shall be prepared and stamped by the Contractor's registered surveyor.

3.04 CERTIFICATION OF BACKFILL

A. Upon completion of backfilling operation, Contractor's material testing firm shall submit a statement certifying by a Professional Engineer registered in the state of Washington that indicates backfilling operations were completed in compliance with these project Specifications.

3.05 SITE GRADING AND RESTORATION

A. After backfilling of excavations, grade the Site as specified in this subsection.

B. Grade areas to the contours indicated on the Drawings. Shape the soil surface to provide a smooth transition to existing grade at the limits of the disturbed areas.

C. Shape and compact fill with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.

D. Smooth the finished surfaces for general site grading within tolerance of 0.1 feet above or below the required elevation and per the direction of the Engineer. Grades shall be feathered to meet surrounding walkways and appurtenances, and so that no trip hazards are created. Ensure positive drainage for all surface areas within construction limits.

3.06 MAINTENANCE

A. Protect newly graded areas from traffic and erosion. The work shall be sequenced to minimize disturbance of completed areas.

B. Where completed areas are disturbed by subsequent project operations or adverse weather, fill and reshape the eroded areas for acceptance of the work.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02317

TRENCHING FOR SITE UTILITIES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Quality assurance
C. References
D. Submittals
E. Project conditions
F. Fill materials
G. Examination
H. Trenching
I. Preparation for utility placement
J. Backfilling
K. Tolerances
L. Field quality control
M. Clean-up

1.02 SUMMARY

A. This section includes construction trenching, backfilling, and compacting for sheet pile installation trench, storm drains, water lines, sewer lines, construction water treatment system piping, injection wells, SVE wells, monitoring wells, and soil gas probes, telephone conduit, electrical power conduit, and Town telecommunications conduit.

B. Related Sections:

1. Section 01150 – Health and Safety
2. Section 02110 – Excavation and Handling of Non-Impacted and Impacted Material
3. Section 02318 – Trench Safety Systems
4. Section 02510 – Water Distribution
5. Section 02630 – Storm Drainage System

1.03 QUALITY ASSURANCE

A. Construction of storm drains, water mains and services, sanitary sewer, and telephone, power, Town telecommunications conduit shall be performed in accordance with the WSDOT Standard Specifications, 2012, Division 7 and Section 1-07.17 and applicable PSE and Verizon standards.

1.04 REFERENCE

A. WSDOT Standard Specifications, 2012

1.05 SUBMITTALS

A. All submittal review and approval shall be completed prior to start of the actual water work in accordance with Specifications Section 01330 - Submittal Procedures.

1.06 GENERAL

A. Provide sufficient quantities of approved backfill to meet the Project schedule and requirements. As necessary, stockpile materials on-site in advance of the actual need.

B. If approved backfill material is stockpiled on-site, locate and construct the stockpiles so there is no interference with other Project construction activity.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials; cover and maintain with plastic sheeting when stockpile is not being used.

C. Verify survey control marks for the Project work are in-place and are clear and understood.

D. Protect survey control points and stakes, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Coordinate trenching for utilities on the railyard with BNSF.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. All fill materials will be as specified in Section 02060 – Aggregate Material.

B. Non-impacted excavation material may be used for backfill as approved by the Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities.

C. Where conflict exists, notify utility company and coordinate and cooperate to remove and relocate the utility.

3.02 TRENCHING

A. Notify the Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

B. Comply with the requirements of Section 02318−Trench Safety Systems.

C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored, except within the roadway right-of-way where sloping to angle of repose shall not be allowed and shoring boxes or other suitable means of trench safety shall be required.

D. Do not interfere with soil in the zone that supports the foundations of any structures.

E. Cut trench width and depth in accordance with the Plans and Specifications. Cooperate in allowing inspection of installed utilities.

F. Do not pile excavated material within two (2) feet of the edge of the trench. Remove loose matter from the trench edges.

G. All trenching within the building is to be done with hand tools only. Protect all adjacent finished surfaces. Do not stockpile excavated material or backfill materials on the unprotected finished floor slab.

H. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

I. Remove any excavated material that is unsuitable for re-use from the site.

J. Clean excavated material designated by the Engineer for re-use shall be stockpiled in an area approved for stockpiling clean, excavated material in accordance with these Specifications. At all times keep non-impacted material segregated from impacted material.

3.03 PREPARATION FOR UTILITY PLACEMENT

A. Over-excavation: Excavate soft, pumping areas of the grade that do not meet compaction requirements or support traffic.

B. Compact subgrade by mechanical means to 95 % of maximum density as determined by compaction control test, Section 02-03.3(14)D of the WSDOT Standard Specifications.

C. Do not open more trench in one day than will be backfilled prior to leaving Project for that day's shift. At the end of each work day completely secure the trenching operation for pedestrian and vehicular traffic.

3.04 BACKFILLING

A. Correct areas that are over-excavated: use appropriate and acceptable backfill compacted to minimum 95% percent of maximum density determined by compaction control test, Section 02-03.3(14)D of the WSDOT Standard Specifications.

B. Pipe bedding: Place and compact gravel bedding material in six (6)-inch lifts. Work the bedding beneath the pipe haunches and compact thoroughly to 95% of maximum density determined by compaction control test, Section 02-03.3(14)D of the WSDOT Standard Specifications.

C. Pipe zone backfill: Place and mechanically compact material in six (6)-inch lifts; compact to 95% of maximum density determined by compaction control test, Section 02-03.3(14)D of the WSDOT Standard Specifications.

D. Coordinate construction to avoid conflict with other aspects of the construction Project. Do not allow pipe construction to conflict with other phases of the construction.

E. Complete the backfilling operation the same day the excavation was made and in accordance with Section 02310 – Backfilling and Grading. Do not leave open, unprotected, unsecured trenches overnight or over the weekend.

3.05 TOLERANCES

A. See the WSDOT Construction Manual, Sections 1-6 and 9-5.6, for the list of acceptable course and material tolerances. Pipe grades shall have a tolerance of 0.02' or as approved by the Engineer.

3.06 FIELD QUALITY CONTROL

A. See Section 01450 – Quality Control, for general requirements for field inspection and testing.

B. Perform trench and roadway compaction density testing on compacted fill and on roadway bases in accordance with the WSDOT Standard Specifications and the WSDOT Construction Manual.

3.07 CLEAN-UP

A. Remove unused stockpiled materials. Grade stockpile area so that surface run-off is picked up by the drainage system in order to prevent standing surface water. Clean and dress the Project in preparation for final inspection and formal Owner acceptance.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02371

GEOTEXTILE AND GEOMEMBRANE

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Quality Assurance
C. Materials
D. Placement
E. Cover

1.02 SUMMARY

A. Section includes placing geotextile and geomembrane placed as indicated in the Plans.

B. Related Sections:

1. Section 01330 – Submittal Procedures.
2. Section 02110 – Excavation and Stockpiling
3. Section 02310 – Backfilling and Grading
4. Section 02317 – Trenching for Site Utilities

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed geotextile and geomembrane installation similar in materials, design, and extent to that indicated for this Project and with a record of successful in-service performance.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Furnish materials in accordance with the Plans and the above referenced Specifications.

B. Geotextile Fabric – woven: Non-biodegradable, woven; C70/06 manufactured by ConTech, or equivalent as approved by Engineer for use as filter fabric.

C. Geotextile Fabric – non-woven: Non-biodegradable, non-woven PermeaTex 4160 from Northwest Linings or equivalent as approved by Engineer for use as indicated on plans.

D. Geomembrane: 20-mil STEGO Wrap Vapor Barrier or equal as approved by Engineer for use as a vapor barrier in construction of the cap between the school and the sheetpile wall.

PART 3 – EXECUTION

3.01 PLACEMENT

A. Place the geotextile and geomembrane materials in locations as shown on the Plans.

B. Overlap geotextile fabric and geomembrane edges at least 18 inches, with the upslope edge overlying the downslope edge.

C. Install geomembrane vapor barrier in accordance with manufacturers recommendations for vapor barrier installations by qualified personnel chosen by the Contractor.

D. Place geotextile and geomembrane materials evenly and carefully to minimize wrinkles and to attain complete coverage. Place panels in one consistent operation to preclude disturbance or displacement of backfill. All geomembrane penetrations shall be sealed in accordance with manufacturer's recommendations.

E. Place geotextile interior to School where soil is exposed. This includes but is not limited, the area beneath the stairwell at the east entry to the School. Geotextile placed interior to school shall be covered with 4 inches sand. Geotextile shall extend a minimum of 6 inches up existing walls and sealed in accordance with manufacturer's recommendation.

3.02 COVER

A. Cover geotextile and geomembrane materials immediately with at least 6 inches of material for protection from equipment. Do not drive equipment on geotextile and geomembrane materials without at least 6 inches of cover material to protect material from penetration.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02450

RAILROAD WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Quality Assurance
C. Submittals
D. Railroad Notification
E. Railroad Construction Plan
F. Safety
G. Coordination with BNSF
H. BNSF Performed Work
I. Work within the BNSF ROW
J. Re-vegetation for Railroad ROW

1.02 SUMMARY

A. This Section specifies general work practices and coordination for all work over, under, and adjacent to the BNSF railroad tracks.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all Work required by the Contract Documents.

1. Section 02150 - Geotechnical Instrumentation and Monitoring
2. Section 02260 - Excavation Support and Protection Shoring
3. Section 02920 – Sod

1.03 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revision of the following document. It is a part of this Section as specified and modified. In case of conflict between the requirements of this Section and that of the listed document, the requirements of this Section shall prevail.

Reference	Title
49 CFR 214	Railroad Workplace Safety

1.04 SUBMITTALS

A. Procedures: Section 01330 – Submittal Procedures.

B. Excavation Support System: Section 02260 - Excavation Support and Protection Shoring.

C. Railroad Construction Plan as part of the TEP:

1. Instances when the Contractor is going to affect BNSF ROW (Right of way).

1.05 RAILROAD NOTIFICATION

A. The Engineer will contact the BNSF Roadmaster at least 30 days in advance of the time when any work by BNSF is anticipated to be required:

1. To establish work schedule.
2. To request BNSF flaggers and other BNSF crews for the public and construction crossings.

1.06 RAILROAD CONSTRUCTION PLAN

A. Required for all work within 50 feet of the BNSF ROW.

B. In accordance with BNSF Design Guidelines for Industrial Track Projects or BNSF Utility Accommodation Policy, as applicable (www.bnsf.com/tools/fieldengineering/pdf/utilacc.pdf).

C. Include the following:

1. Proposed sequence and time schedule: Time frames indicated shall be consistent with the Construction Schedule and work sequence.
2. Description of the sequence of work to be performed at each track crossing and the time required for each work task.
3. Description of the tasks to be performed by the Contractor and BNSF personnel.
4. Identify all materials to be furnished and disposed of by BNSF and the Contractor at each track crossing and work location.
5. Identify when the use of railroad and roadway flaggers are required.
6. Include all restrictions, including those listed in the Contract Documents and the limitations on interruption of rail traffic.
7. Clearly identify the sequence of construction for utility crossing construction.

D. Submit to the Engineer for review per Section 01330−Submittals Procedures.

E. Changes or modifications require BNSF approval prior to implementation.

1.07 SAFETY

A. Work where Contractor personnel are within 25 feet of the centerline of any railroad track shall follow the requirements of 49 CFR 214 and BNSF requirements.

B. All Contractor and subcontractor personnel working within the BNSF ROW shall complete the certification requirements in Specifications Section 01150 – Health and Safety Requirements, in particular, the Railway Engineering Contractor Safety Orientation found on the website www.contractororientation.com and be registered through the E-Railsafe program found on the website www.e-railsafe.com.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 COORDINATION WITH BNSF

A. Schedule all discussions and meetings between the Contractor and BNSF through the Engineer.

B. Submit through the Engineer all correspondence, notices, and submittals that must be provided to BNSF.

C. Unless otherwise indicated, the Contractor shall be responsible to coordinate with BNSF through the Engineer for all work by BNSF in support of this Contract within the BNSF ROW.

D. Surface Regulating Crew: Obtain and coordinate crews to be on standby during Railroad Utility Crossings construction through the BNSF ROW.

3.02 BNSF PERFORMED WORK

A. BNSF will provide flagging services necessary for the safety of BNSF's property, employees, trains, engines, facilities, and the operation of trains during the Work affecting the ROW.

B. Railway flagger and protective services are required when:

1. Work activities are within 25 feet horizontally from the centerline of the nearest track.
2. Any work interferes with or has the potential to interfere with the safe operation of trains at timetable speed.
3. Cranes or similar equipment are positioned beyond 25 feet from the centerline of the nearest track and could foul the track in the event of a tip over or other catastrophic event.
4. When any hazard is presented to BNSF track, communications, signal, electrical, or other facilities.

3.03 WORK WITHIN THE BNSF ROW

A. Perform work in a manner that will not endanger or interfere with the safe and timely operations of BNSF and its facilities.

B. Prior to any work within BNSF ROW, contact the Engineer to coordinate the location of:

1. Fiber optic lines.
2. Communication lines.
3. Any other cable lines and systems.

C. Cooperate proactively with BNSF to limit the effects of settlement and heave of the railroad tracks.

D. Unless described in the Railroad Construction Plan, do not perform the following activities within 25 feet of the centerline of any track:

1. Any testing or investigations.
2. Any activity using mechanized equipment or machinery.
3. Placement or storage of any equipment, tools, or materials.

E. Cover and secure all open holes and excavations.

F. Remove all combustible materials from around wooden poles within the BNSF ROW in proximity of the Work.

3.04 RE-VEGETATION OF RAILROAD ROW

A. Re-vegetate railroad property in accordance with Section 02920 − Sod and Hydroseeding.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02464

SHEET PILING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Permits and Approvals
C. References
D. Submittals
E. Construction Sequence
F. Delivery Storage and Handling
G. Sheet Pile Installation Equipment
H. Metal Sheet Piling- Owner Supplied
I. Joint Sealant
J. Installation
K. Vibration Levels
L. Inspection of Installed Piling
M. Pulling and Reinstalling

1.01 SUMMARY

A. This section describes the owner supplied sheet piles and the allowable installation technique for this project. The owner does not want vibration energy to enter the adjacent structure, so they are specifying a direct-push technique that also has an auger drill to loosen the coarse gravels as the sheet pile is installed. Only this type of system will be allowed.

B. Related Sections:

1. Section 02110 - Excavation and Stockpiling
2. Section 02280 – Permeation Grouting

1.02 PERMITS AND APPROVALS

A. This section specifies Work consisting of furnishing all plant, labor, equipment, appliances, and materials and in performing all operations in connection with the installation of all steel sheet piling, complete, in strict accordance with this section of the Specifications and the applicable Plans, and subject to the terms and condition of the Contract.

B. Contractor shall coordinate de-energizing power and telecommunications lines as necessary to complete sheet pile construction. The Contractor shall complete the work in the vicinity of these lines such that service outages are not longer than 10 hours, including the time required to re-install each line. A two-week notice is required to schedule PSE and Verizon field work.

C. The work to be performed under these specifications includes but is not limited to the following:

1. Installation of all owner-supplied steel sheet piling required, unless otherwise specified by the Engineer, including special piling required for closures and corners.
2. Staging sheet pile.
3. Removing sheet pile.
4. Excavation, removal, and disposal of all materials and obstructions of whatever nature encountered that interfere with the installation of the sheet piling.

D. Sheet pile systems for this Work are Metal Sheet Piling and labeled as:

1. Sheet pile – Temporary (Cantilever) – Designed and Provided by Owner. This shoring system consists of temporary sheet pile designed and provided by the Owner using Cantilevers to be installed by Contractor to the station and lines as shown on the Plans. The Owner will supply PZ-35 sheet piles for this work. The Contractor shall furnish and install all other components of the system.

E. The sheet pile shoring systems described above are for a physical groundwater barrier as indicated on the Plans.

F. Sheet pile installation shall not be performed using standard vibratory equipment. Instead, sheet piles shall be installed via a non-vibratory, push-in method that is referenced in this specification.

G. The Engineer will provide all available subsurface exploration information for the Contractor. Boring logs relevant to the remediation areas are provided in the Geotechnical Data Report prepared on August 24, 2009 by Jacobs Associates for Farallon Consulting in Appendix C of these Specifications.

H. Contractor shall have a competent person on site at all times that can properly evaluate sheet pile installations. This person shall be indentified in the shoring submittals and have the required training to be a competent person for sheet pile shoring in accordance with Washington State Regulations. This person shall have a minimum of five (5) years of heavy construction experience installing sheet piles and monitoring sheet pile installation on projects similar to this project.

I. Contractor shall be aware of the windy conditions that may be prevalent in Skykomish that may delay sheet pile installation at any time. There may be times when sheet pile installation is hindered or stopped due to safety concerns from excessive wind.

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

a. ASTM A 6/A 6M (1995b) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
b. ASTM A 572/A 572M (1993a) Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

1.04 SUBMITTALS

A. The Contractor shall submit the following to the Engineer for approval in accordance with Section 01300- Submittals:

1. Experience of sheet pile installation-competent person with experience using non-vibratory, press-in method for sheet pile installation.
2. Pile Installation Equipment Schedule:
    a. Complete descriptions of sheet piling installation equipment, including pile templates and other installation appurtenances required by the product manufacturer, shall be submitted for approval prior to commencement of work.
    b. Pile installation equipment submitted by the Contractor shall be designated by a person experienced in matching adequate sheet pile installation equipment to the sheet pile provided on the project, and to the anticipated installation conditions from the site. Consideration shall be given to the weight of the piling to be installed, the soil conditions at the site, the groundwater conditions at the site, the proximity of structures, the possibility of difficult installation conditions, the construction schedule and the length of sheet pile wall being contemplated.
3. Installation Records:
    a. Records of the sheet piling installation operations shall be submitted each day after installation is completed for a particular pile. These records shall provide a system of identification that shows the disposition of approved piling in the work, piling dimensions, and top and bottom elevations of installed piling.
4. Pile Installation Procedures:
    a. Procedures to include pile installation schedule, methods to be utilized, including templates and installation sequences, and contingency plan for difficult installation conditions. Specific attention shall be made to address sheet pile installation in windy conditions.

1.05 CONSTRUCTION SEQUENCE

A. Contractor shall conduct shoring installations in accordance with the milestones set forth in Bid Form, Schedule A, Construction Milestones.

B. Contractor shall complete shoring installations with the sequence as shown on the Plans.

1.06 DELIVERY, STORAGE AND HANDLING

A. Owner-furnished sheet piling is stored on site by BNSF and shall be handled by the Contractor. Owner-supplied piles have picking holes cut in the tops of the piles. The Contractor shall handle the sheet pile in a manner recommended by the manufacturer to prevent permanent deflection, distortion, or damage to the interlocks. Any damage that does occur shall be drawn to the attention of the Engineer, and the Contractor shall submit their proposal for remedial works for approval by the Engineer prior to commencement. The repairs or replacement shall be made at the Contractor's expense.

PART 2 – PRODUCTS

2.01 SHEET PILE INSTALLATION EQUIPMENT

A. Sheet piles shall be installed using the following equipment:

1. Giken Super Crush Piler SCU-400M, Giken Super Crush Piler SCU-600M, or approved equal.

2.02 METAL SHEET PILING – OWNER SUPPLIED

B. Metal sheet piling supplied by the Owner will consist of PZ-35, Grade 50 sheet pile sections of varying lengths.

2.03 JOINT SEALANT

A. Joint sealant, supplied by Contractor, shall be Adeka Ultraseal A-30 or an approved equal, installed in accordance with the manufacturer's recommendations.

PART 3 -EXECUTION

3.01 INSTALLATION

A. Pile Installation Equipment and Operators

1. All pile installation equipment shall be inspected prior to use on the Project site for proper operation, condition, leaks, etc. and conform to the manufacturer's product requirements.
2. All equipment operators shall be experienced for the equipment they are operating and shall conduct daily inspections of their equipment prior to operating.

B. Marking

1. The piling shall be marked with a line at 1-foot increments starting at the bottom of the pile with a waterproof white or yellow marker. Depth labels shall be placed at 5-foot increments next to the appropriate line, beginning at the bottom of the pile.

C. Placing

1. Any excavation required within the area where sheet pilings are to be installed shall be completed prior to placing sheet pilings.
2. Holes shall not be burnt/drilled nor lifting brackets welded to the sheet piling without prior approval of the Engineer.
3. Pilings shall be placed plumb, with out-of-plumbness not exceeding 1/8 inch per foot of length.
4. Temporary wales, templates or guide structures shall be provided to ensure that the pilings are placed and installed to the correct alignment. At least two templates shall be used in placing each piling, and the maximum spacing of templates shall not exceed 20 feet.
5. Variation from the proposed alignment shall not exceed 1 foot horizontally unless approved by the Engineer.
6. When placing sheets, "riding" of sheet piles (even with stirrups and full body harness) shall not be permitted. A sheet pile mechanical pile threader shall only be used due to the windy conditions prevalent in the Town of Skykomish, unless otherwise directed by Engineer.

D. Installation

1. Sheet piles shall be installed using the following equipment:

a. Giken Super Crush Piler SCU-400M, Giken SCU-600M, or approved equal.
b. All necessary equipment as specified per manufacturer.

2. Pilings shall be installed to the minimum depths shown on the Plans.
3. The sheet pile shall extend up to the elevation of the working platform where it shall be cut off by the Contractor as directed by the Engineer.

E. Cutting-Off and Splicing

1. Pilings installed to refusal or to the point where additional penetration cannot be attained shall be cut off by the Contractor as directed by the Engineer.
2. If directed by the Engineer, pilings shall be spliced as required to install them to depths greater than shown and extend them up to the required top elevation. Additional cost to the Owner shall be approved through the Engineer prior to commencing the work.
3. Pilings adjoining spliced pilings shall be full length unless otherwise approved. Ends of pilings to be spliced shall be squared before splicing to eliminate dips or camber. Pilings shall be spliced together with concentric alignment of the interlocks so that there are no discontinuities, dips, or camber at the abutting interlocks. Spliced pilings shall be free-sliding and able to obtain the maximum swing with contiguous pilings.

3.02 VIBRATION LEVELS

A. During the duration of sheet pile installation, vibration monitoring at the wall of the Skykomish School building will be performed by the engineer. This data will be made available to the contractor. Vibrations must be kept to a minimum, and the following levels are the action limits:

1. Warning Action Limit: 0.5 inch/second
2. Stop Work Action Limit: 2 inches/second

If the vibration levels are exceeded, the pile installation work shall be halted and a plan will be developed to reduce the induced vibrations.

3.03 INSPECTION OF INSTALLED PILING

A. The Contractor shall inspect the interlocked joints of installed pilings extending above ground. Pilings found to be out of interlock shall be removed and replaced at the Subcontractor's expense.

B. The Engineer will have a representative on the site, but the Contractor will be responsible for monitoring all installation and verification records.

3.04 PULLING AND REINSTALLING

A. In the pulling and reinstalling of piles as directed by the Engineer, the Contractor shall pull selected pilings after installing to determine the condition of the underground portions of pilings at the Engineer's expense. Any piling so pulled and found to be damaged to the extent that its usefulness in the structure is impaired shall be removed and replaced at the Engineer's expense. Pilings pulled and found to be in satisfactory condition shall be reinstalled when directed. Owner-furnished pilings pulled and not reinstalled shall be stored as directed.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02501

STORM DRAINAGE SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. References
C. Definitions
D. System description
E. Submittals
F. Quality assurance
G. Delivery, storage, and handling
H. Materials
I. Manufactured units
J. Source quality control
K. Installers
L. Examination
M. Preparation
N. Installation
O. Construction
P. Repair/Restoration
Q. Field quality control
R. Clearing
S. Protection

1.02 SUMMARY

A. Section includes the proposed storm drainage system piping indicated on the Plans.

B. Related Sections:

1. Section 01330 – Submittal Procedures

2. Section 02317 – Trenching For Site Utilities

1.03 REFERENCES

A. Comply with the requirements of Section 01410 – Regulatory Requirements and as listed herein. The following is a list of standards referenced in this Section:

1. ANSI A21-11.
2. ASTM A 36 – Standard Specification for Carbon Structural Steel.
3. ASTM C 857 – Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
4. AWWA C-111.
5. AWWA C906-99.
6. King County Road Standards, 2007.

7. WISHA.
8. WSDOT Standard Specifications for Road, Bridge, and Municipal Construction, 2012, M41-10.

1.04 DEFINITIONS

A. DI: Ductile iron pipe.

1.05 SYSTEM DESCRIPTION

A. Provide a storm drainage system as indicated on the Plans and necessary for a complete and functional system meeting the Project requirements and conforming to section 7-04, 7-05, 7-07, and 7-08 of WSDOT Standard Specifications.

B. Layout:

1. Furnish, set, mark, and adjust line location stakes in accordance with industry and professional standards.
    a. A qualified person experienced in layout and engineering fieldwork must be provided by the Contractor and assigned to the Contractor's crew for the duration of the Work requiring control.
    b. Necessary equipment, supplies, and instruments must be provided and unconditionally available to the layout engineer.
    c. Provide the same person and equipment, supplies, and instruments at no further cost to the Project for purposes of obtaining the Engineer confidence the layout activities are properly performed.
2. The Contractor is responsible for review of records pertaining to the existing underground utilities.
    a. The Contractor is responsible for avoiding damage to underground utilities.
    b. Notify the Engineer immediately about utilities that are encountered in locations or conditions differing from the available information, including the Plans.
3. The Contractor is responsible to notify the Engineer immediately about proposed utilities that may be in conflict with the Plans.
4. Notify Engineer not less than two days in advance of proposed utility interruptions.

1.06 SUBMITTALS

A. See Section 01330 – Submittal Procedures for submittal procedures.

B. Product Data Sheets: Provide for each manufactured product installed under Work of this Section.

1. Include fittings, couplings, and joints.

C. Diagrams: Provide scale diagrams of assemblies, structures, or other items that are materially different from the conditions indicated in the Plans.

1. Include special fittings, including connections manufactured specially for the Project.

1.07 QUALITY ASSURANCE

A. Subcontractor Qualifications:

1. Workers Qualifications: To be qualified and competent.

B. Regulatory Requirements: See referenced codes, regulations in accordance with Section 01330 – Regulatory Requirements.

C. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All pipes shall be clearly marked with type, class, and thickness. Lettering shall be legible and permanent under normal conditions of handling and storage.

B. Store in original protective packaging until time of installation.

C. Do not store plastic structures, pipe, and fittings in direct sunlight.

D. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gravity Storm Drainage Pipes and Fittings:

1. Comply with WSDOT Standard Specifications Section 7-04.2 – Materials.
2. Use only the following materials for the gravity storm drainage piping and fittings. Material type of each storm sewer run is identified in the Plans. No substitutions will be allowed for runs identified as Ductile Iron. If storm drainage piping material is not clearly identified on the Plans, pipe material shall be Ductile Iron:
    a. Ductile Iron Pipe Class 50: In accordance with WSDOT Standard Specifications Section 9-30.1(1).
    b. ADS N-12 WT (water tight) Corrugated Polyethylene Storm Sewer Pipe: In accordance with WSDOT Standard Specification Section 9-05.20.
    c. PVC Schedule 80: pipe shall be domestically produced rigid polyvinyl chloride (PVC) compound, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784

B. Pipe for wall drains and onsite drainage systems shall be PVC Schedule 80 unless otherwise noted on the Plans.

C. Fittings, and Joints:

1. Fittings:
    a. Provide fittings manufactured from the same material as the pipe.

D. Bedding and Backfill Materials: Provide materials in accordance with Section 02317 – Trenching for Site Utilities and as indicated on the plans.

2.02 MANUFACTURED UNITS

A. Concrete Catch Basins:

1. Provide units in accordance with King County and WSDOT Standards.
2. Refer to the Plans for Types and locations.
3. Provide precast concrete catch basins.
4. Conform to WSDOT Standard Specification 7-05 for additional requirements not listed with the King County Standards.

B. Catch Basin Frames and Covers:

1. Provide in accordance with King County Road Standards and per the Plans.

C. Catch Basin Ladders:

1. Provide units in accordance with King County Road Standards.

D. Catch Basins:

1. Construction: Precast concrete vault products and riser sections constructed in accordance with ASTM C 857.

E. Roof Drains:

1. Provide below-grade collection and transport of rainwater from building.
2. Material: CPEP OR PVC; except any portions indicated on the Plans to be DIP.
3. Joints: Same materials as the piping to be joined.

2.03 SOURCE QUALITY CONTROL

A. Products, fabrications, and other items of this Section are to be designed, manufactured, installed, and made functional consistent with proper and appropriate hydraulic design practices.

PART 3 EXECUTION

3.01 INSTALLERS

A. Installer is required to be experienced in work of the scope and quality indicated, with a record of successful in-service performance.

3.02 EXAMINATION

A. Verify conditions are satisfactory to receive work of this Section. Do not commence work until unsatisfactory conditions have been corrected.

B. Beginning work constitutes acceptance of conditions.

C. Verify existing utility locations from the available records.

D. Make appropriate provisions for storm drainage lines in such a manner to avoid interference with other Work.

E. Understand the Plans, including any discrepancies, differences, or ambiguities that may exist between engineering disciplines prior to attempting Work of this Section.

3.03 PREPARATION

A. Field Measurements: Verify on job before beginning work.

B. Protect surrounding areas and surfaces from damage prior to beginning work of this Section.

C. Trenching:

1. Perform trenching per the requirements of Section 02317 – Trenching for Site Utilities
2. Make excavations consistent with the alignment, elevation, grade, and slope indicated on the Plans.

D. Foundations:

1. Comply with the requirements of Section 02317 – Trenching for Site Utilities.
2. Grade bottom of excavations to provide a smooth, firm, stable, unyielding, and rock-free foundation.
3. Remove unsuitable earth materials.
4. Backfill over-excavated areas.

3.04 INSTALLATION

A. Pipe Installation:

1. Conform to the requirements of WSDOT Standard Specifications Section 7-08.3— "Construction Requirements."

B. Install pipe strap anchors where pipe slope exceeds 20 percent.

C. Pipe Beveling:

1. Bevel pipe ends to match the slope, except:
   a. Do not bevel CPEP in excess of four (4) horizontal to one (1) vertical.
2. Minimum length of the un-beveled portion of pipe is six (6) feet.

D. Manufacturer's Instructions:

1. Comply with manufacturer's instructions, including technical bulletins and product catalog data.
2. Contact the product representative to confirm appropriate procedures prior to beginning installation.
3. Retain manufacturer's written installation instructions at the project site.
4. Pipes buried over fifteen (15) feet in depth:

a. Install pipe in accordance with manufacturer recommendations.

E. Installation, General:

1. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
2. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
3. Use manholes or catch basins for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
4. Reducing size of piping in direction of flow is prohibited.

3.05 CONSTRUCTION

A. Footing and Wall Drains:

1. Connect footing and wall drains to the storm drainage system as indicated on the plans.

3.06 REPAIR/RESTORATION

A. Changes to Existing Structures:

1. Core drill every penetration.
2. Repair damage resulting from work in and around existing elements.
3. Where existing pipe is to be connected to a new structure, remove and replace the pipe, or add fittings, or a combination as necessary to provide a condition acceptable to the Project Representative and in compliance with King County Road Standards.
4. Where a new pipe is indicated to be connected to an existing structure:
    a. Make appropriate, structurally sound, and functionally adequate modifications.
    b. Rebuild the structure as necessary to provide a condition acceptable to the Project Representative and in compliance with King County Road Standards.
5. Provide sufficient work space around retrofit to permit adequate and necessary inspection.
6. Perform connections, penetrations, seals, and grouting in accordance with this Section.

B. Following stabilization of site the Contractor shall provide video survey documenting that the storm system piping within the Site is free of debris.

3.07 FIELD QUALITY CONTROL

A. Place plugs in the ends of uncompleted piping at the end of the workday, or whenever work stops.

B. Perform post-construction testing in accordance with WSDOT Standard Specifications Section 7-04.3(1) – Cleaning and Testing.

3.08 CLEANING

A. Remove extra materials, debris, superfluous materials, residue and other foreign materials as the work progresses.

1. Remove dirt and soil accumulations in structures, pipes, and basins.
2. Flush piping between catch basins to remove collected debris.

3.09 PROTECTION

B. Protect work of this Section from damage and deterioration until completion and acceptance by Owner.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02510

WATER DISTRIBUTION SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. References
C. Submittals
D. General Requirements
E. General Pipe Materials
F. Mylar Tape
G. Tracking Wire
H. Fire Hydrants
I. General Installation Requirements
J. Pipe Installation
K. Connection to Existing Water System
L. Damage to Water System
M. Thrust Blocks
N. Cleaning, Testing, and Disinfection of New Mains
O. Hydrostatic Tests of New Pipe
P. Leakage Tests of New Pipe
Q. Concurrent Hydrostatic Test of New Pipe
R. Pressure Tests of Existing Pipe
S. Disinfection When Cutting into or Repairing Existing Mains
T. Identification and Tracer Wire
U. Separation Between Water and Sanitary Sewer
V. Cleanup
W. Record Drawings

1.02 SUMMARY

A. Section includes installation of the water mains and all necessary appurtenances to supply potable water as shown on the Plans.

B. Related Sections:

1. Section 01330 – Submittal Procedures
2. Section 02317 – Trenching for Site Utilities

1.03 REFERENCES

A. WSDOT Standard Specifications for Road, Bridge, and Municipal Construction, 2008 M41-10.

B. Comply with Standards of authorities having jurisdiction for potable water-service piping.

C. Comply with standards of authorities having jurisdiction for fire-protection water service piping.

D. Comply with AWWA standards.

E. ASTM D2241 – Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Related Pipe (SDR Series).

F. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

G. WSDOT Standard Specifications, Section 7-09

1.04 SUBMITTALS

A. All Submittals shall be submitted in accordance with Section 01330 – Submittal Procedures.

B. Submit manufacture's documentation, including product data sheets, showing compliance with this Section's requirements for the following products:

1. PVC Pipe and Fittings.
2. Ductile Iron Pipe and Fittings.
3. HDPE Pipe and Fittings

C. Submit record Plans in accordance with Section 01330 – Submittal Procedures.

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All pipe material, solder and flux shall be lead free (less than 0.2 percent lead in solder and flux and less than 8.0 percent lead in pipes and fittings). All materials that come into contact with drinking water during its treatment, storage, transmission, or distribution shall not adversely affect drinking water quality or public health and must be approved and certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61(ANSI/NSF Standard 61). Only NSF approval types of pipe outlined in this Section may be used, unless otherwise specified on the Plans.

B. All Water Distribution System work shall conform to the requirements of WSDOT Standard Specification 7-09, 7-12, 7-14, and King County Standards.

C. Fire hydrants shall conform to AWWA C502 and shall be listed by Underwriters Laboratories Inc. in accordance with UL 246.

2.02 GNERAL PIPE MATERIALS

A. All water distribution system pipe and fittings shall conform to the above stated standards and be of the size and type as indicated in the Plans.

2.03 MYLAR TAPE

A. The tape shall be 2 inches wide, of blue color and have imprinted on the tape "Caution-Buried Water Line Below." The tape shall be a printed foil warning tape encased in Mylar and shall be easily detected by electronic pipe locators. The tape shall be laid the entire length of the trench. Tape shall be equivalent to Terra-Tape by Griffolyn Co., Inc. of Houston, Texas.

2.04 TRACKING WIRE

A. No. 12 AWG solid plastic-coated copper wire shall be installed on top of all force mains where non-metallic pipe is used. The wire shall be laid the entire length of the trench and shall be continuous. The Contractor shall demonstrate continuity in wire through the entire length of the Project. The tracer wire shall be run up and be securely attached at an exposed point and at each end.

2.05 FIRE HYDRANTS

A. Acceptable manufacturers:

1. Clow Medallion; M&H Style 929; Muller Super Centurion 200; American Darling B62B; or approved equal.

B. Hydrants shall be the "Traffic Model" type equipped with a center 1-1/4-inch operating nut and shall be designed so that the main valve on the hydrant remains closed should the hydrant nozzle section be broken off by a traffic accident. Main valve opening shall be minimum 5-1/4-inch diameter and water main connection shall be a 6-inch mechanical or flange shoe connection.

C. Hydrants shall have at least two 2½-inch hose ports with caps, which shall have National Standard male threads. The pumper port shall be 4 inches in diameter with Seattle Standard male thread. The pumper port shall be provided with a 4-inch Storz assembly.

D. Hydrants shall be painted with two coats of high gloss paint suitable for metal application over shop applied primer base coat. Consult with the Local Jurisdiction for the appropriate color of paint application.

E. Fire Hydrant Adapter Requirements:

1. Fire hydrants shall be supplied with two 14-20 holes drilled and tapped, 180 degrees apart through female thread, to lock adapter to hydrant.
2. Contractor shall supply any required sealants and/or gaskets.
3. Contractor shall supply two sets of installation tools.

F. Fire Hydrant Cap Requirements:

1. Contractor shall provide and install one nitrile/vinyl rubber seal, suction style for zero leakage, color gray.
2. The hydrant shall come equipped with a 1/8-inch diameter cable, either rust proof or vinyl coated, a minimum of 18 inches in length, with compression connections to attach the cap to the hydrant.

3. The force required to connect or disconnect the adapters shall be a minimum of 18 ft/lbs, maximum of 30 ft/lbs.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. All materials shall be inspected before construction begins. Pipe, fittings, valves, and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the Site of the Project by the Contractor. They shall at all times be handled with care to avoid damage. Under no circumstances shall they be dropped. In distributing the material at the Site of the Work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. Pipe shall be placed on the Site of Work parallel with the trench alignment and with bell ends facing the direction in which the Work will proceed unless otherwise directed. The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times.

B. Cutting pipe for inserting fittings, or closure pieces, shall be done in a neat and workman-like manner without damage to the pipe. Unless otherwise directed, pipe shall be laid with the bell ends facing the direction of laying. For lines on an appreciable slope, bells shall face upgrade. Wherever necessary to deflect the pipe from straight line, whether in the vertical or horizontal plane to avoid obstructions, the degree of deflection shall not exceed 2-1/2 degrees. No pipe shall be laid in water or when the trench condition or the weather is unsuitable for such Work. Installation shall be in accordance with manufacturer's instructions.

C. All pipe and fittings shall be carefully lowered into the trench piece by piece by means of derrick, ropes or other suitable tools or equipment in such a manner as to prevent damage to the pipe. Under no circumstances shall pipe or accessories be dropped into the trench. Before lowering and while suspended, pipe shall be inspected for defects and rung with a light hammer to detect cracks. Any defective, damaged, or unsound pipe shall be rejected. All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench and it shall be kept clean by approved means during and after laying. Care shall be taken to prevent dirt from entering the joint space. At all times when pipe laying is not in progress, the open ends of the pipe shall be closed by approved means and no trench water shall be permitted to enter the pipe.

D. Water lines shall not be laid in the same trench with sewer line, gas lines, fuel lines, or electrical wiring.

E. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

F. Store plastic piping and fittings protected from sunlight. Support to prevent sagging and bending. Where water pipe is required to be installed within 3 feet of existing structures, the water pipe shall be cased as depicted on the Plans.

G. All items in contact with potable water shall comply with the national "Reduction of Lead in Drinking Water Act" S.3874.

3.02 PIPE INSTALLATION

A. Pipe shall be installed in accordance with ASTM D2321. Excavation, bedding, and backfill shall be as specified in Section 02317 – Trenching for Site Utilities, and as indicated in the plans. Bedding shall comply with materials specified in Section 02317.

3.03 CONNECTION TO EXISTING WATER SYSTEM

A. The Contractor shall furnish necessary materials and perform all excavation, dewatering, backfilling, etc. necessary to make the connection of a new main to the existing water main. The Contractor shall notify the Engineer and the Town of Skykomish Water Department, a minimum of 48 hours in advance of any planned connections. The Contractor shall be responsible for coordinating Project construction with the Town of Skykomish Water Department.

B. The existing water system is shown on these Plans. The depth of bury of the existing system is approximately 3.5 ft to 4 ft. The contractor shall determine the depths of the connections as illustrated in the plans prior to construction and notify the engineer if discrepancies exist. The contractor shall be responsible for making connection recommendations and be responsible for the materials and construction as part of this work.

3.04 DAMAGE TO WATER SYSTEM

A. Damage to any part of the water system by the Contractor that is then repaired by Town of Skykomish Water Department forces shall be charged to the Contractor on the basis of time and material plus ten (10) percent for overhead and administration.

3.05 THRUST BLOCKING

A. All plugs, caps, bends 11.25 degrees or greater, and tees shall be provided with restrained joints or with thrust blocking. Thrust blocking shall bear directly against the undisturbed trench wall, and shall be made with concrete having a compressive strength of at least 2,500 pounds per square inch. The sides of thrust blocks not subject to thrust may be poured against forms. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks. Thrust blocking should be so arranged that it will not interfere with reworking joints should such work become necessary. If the area for thrust blocking is over excavated beyond the dimensions required by the schedule, additional concrete shall be provided to extend the thrust blocking to undisturbed earth at no additional cost to the Engineer or the Owner.

B. Thrust blocks shall conform to King County Standards and Plans 020504, 020505, and 020506.

3.06 CLEANING, TESTING, AND DISINFECTION OF NEW MAINS

A. All water mains and system components must be cleaned, disinfected and the water passing through them must show by laboratory tests safe results before the system can be

placed in service. Cleaning, testing, and disinfection of the new mains shall comply with all requirements of WSDOT standard specification Section 7-09.

3.08 HYDROSTATIC TESTS OF NEW PIPE

A. The Contractor shall provide all necessary equipment and shall perform all work required in connection with the tests. Each section shall be tested by hydrostatic pressure of 150 pounds per square inch. Each section shall be slowly filled with water, with care taken to expel all air from the pipes. As necessary, the pipe shall be tapped at high points to vent the air. The required pressure as measured at the point of lowest elevation shall be applied for not less than 2 hours and all pipe, fittings, valves, hydrants, and joints shall be carefully examined for defects. Each valve shall be opened and closed several times during the test. All defective joints shall be repaired or replaced. Hydrostatic testing shall not be conducted on any portion of existing pipes or pipe segments within the school building.

3.09 LEAKAGE TEST OF NEW PIPE

A. A leakage test shall be conducted after the pressure test has been satisfactorily completed or concurrently with the pressure test. The duration of the leakage test shall be 2 hours and during the test the main or section of main under test shall be subjected to a pressure of 150 pounds per square inch based on the lowest point in the line or section under test, and connected to the elevation of the test gauge. Leakage is defined as the quantity of water to be supplied into the newly laid pipe or any section with valve or section thereof, necessary to maintain the specified leakage test pressure after the air has been expelled and the pipe has been filled with water at the test pressure. No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula

$$L = \{SD\sqrt{P}\}/266{,}400$$

L = allowable leakage in gallons per hour
S = the length of pipe tested in linear feet
D = the nominal diameter of the pipe in inches
P = the average test pressure during the leakage test in pounds per square inch gauge

B. Any visible leakage detected shall be corrected by the Contractor regardless of allowable leakage specified above. Should the tested section fail to meet the pressure test successfully as specified, the Contractor shall, at no additional expense to the Owner, locate and repair the defects and then retest the pipeline.

3.10 CONCURRENT HYDROSTATIC TEST OF NEW PIPE

A. The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be satisfactory as specified. All replacement, repair, or retesting required shall be accomplished by the Contractor at no additional cost to the Owner or the Engineer.

B. Pressure test and leakage test may be conducted concurrently.

C. Hydrostatic tests and disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be re-accomplished.

1.02 **3.10 PRESSURE TESTS OF EXISTING PIPE**

A. To protect existing pipes, no pressure testing of existing school water pipe shall be conducted. All leaks within 90 days of substantial completion will be repaired at Contractor's expense.

3.11 DISINFECTION WHEN CUTTING INTO OR REPAIRING EXISTING MAINS

A. Disinfection shall be performed when mains are wholly or partially dewatered. Disinfection shall conform to AWWA C651 including trench treatment, swabbing with hypochlorite solution, flushing and/or slug chlorination as appropriate. Residual of not less than 25 mg/l shall remain in the water standing 24 hours in the pipe. The initial chorine content of the water shall be not less than 50 mg/l. Treated water shall be retained in the pipe at least 24 hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 25 mg/l.

B. Following chlorination, treated water shall be flushed from the newly laid pipe until the replacement water throughout the length of the pipe shows, upon test, the absence of chlorine.

C. Bacteriological testing shall be performed after repairs and the chlorination treatment are complete. The Engineer will sample and coordinate the bacteriological testing before placing the lines into service, a satisfactory report shall be received from the King County Health Department or the State Health Department on samples collected from representative points of the new system.

3.12 IDENTIFICATION AND TRACER WIRE

A. Mylar detectable tape shall be installed 6 inches below the top of the trench of the watermains where non-metallic pipe is used. The tape shall be 2 inches wide, of blue color, and have imprinted on the tape "Caution-Water Line Below." The tape shall be a printed foil warning tape encased in Mylar and shall be easily detected by electronic pipe locators. The tape shall be laid over the waterline the entire length of the trench.

B. No. 12 AWG solid plastic-coated copper wire shall be installed on top of all water mains where non-metallic pipe is used. The wire shall be laid over the waterline the entire length of the trench and shall be continuous. The Contractor shall demonstrate continuity in wire through the entire length of the Project. At each fire hydrant the tracer wire shall be run up the hydrant and be securely attached at an exposed point.

3.13 SEPARATION BETWEEN WATER AND SANITARY SEWER

A. Water mains shall be laid at least 10 feet horizontally from any existing or proposed sanitary sewer or sewer manhole. Water mains crossing sanitary sewer mains shall be laid to provide a separation of at least 18 inches between the bottom of the water main

and the top of the sewer and a full length of the water pipe be centered at the point of crossing so that the joints will be equidistant and as far as practical from the sewer.

B. When water mains cross under sewers, the following additional measures shall be taken:

1. A vertical separation of at least 18 inches between the bottom of the sewer and top of the water main.
2. Adequate structural support for sewers to prevent excessive deflection of joints and that will prevent the sewer line from settling onto and breaking the water main.
3. A full length of the water pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.
4. Both the sewer and the water main shall be constructed of water pipe materials and subjected to hydrostatic tests, where practicable with the sewer line, and as prescribed in this document. Encasement of the water pipe in concrete shall also be pre-approved.
5. The contractor will notify the Engineer if the separation between a water line and sewer is less than 18 inches, and the Engineer may require the Contractor to encase one of the utilities at the point of crossing.

3.14 CLEANUP

A. Upon completion of the installation of water line and appurtenances, all debris and surplus materials resulting from the work shall be removed from the site. The work site shall be left in a cleaned and dressed condition.

3.15 RECORD DRAWINGS

A. The Contractor shall keep accurate, legible records of the location and details of all the work. The Contractor shall prepare and submit to the Engineer Record Drawings for all pipes, valves, manholes, tees, water services, fire hydrants, etc. under this contract. The final dimensions, elevations, and locations shall be shown on the Drawings and may depend on the selection of the actual equipment furnished by the Contractor. The Record Drawings shall show all supports, blocking, joint restraints, foundations, special sections within 18 inches of sanitary sewer, special pipes or fittings, etc. Valves shall be referenced from at least two permanent above ground points that can be readily identified. The Record Drawings shall conform to recognized drafting standards, shall be neat, legible, and drawn to a large enough scale to show in detail the required information. The Record Drawings shall be provided to the Engineer in both hard and electronic formats.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02535

SANITARY SEWER SYSTEM

PART 1 – GENERAL

1.01 SECTION INCLUDES

The work specified in this Section includes pipe, fittings, and accessories described herein and as required to completely install the sanitary sewer features as shown on the Plans.

A. Submittals
B. Products – General
C. PVC Pipe Fitting
D. Calder-Type Flexible Couplings
E. PVC Ball Valves
F. PVC Swing Check Valve
G. Valve Boxes
H. Cleanouts
I. Tracer Wire
J. Warning Tape
K. Pipe Bedding
L. Installation – General
M. Bell and Spigot Piping
N. Threaded Piping
O. Valves
P. Excavation
Q. Testing Gravity Sewers
R. Tracer Wire/Warning Tape

1.02 SUBMITTALS

A. Submittals shall be in accordance with Section 01330- Submittal Procedures.

B. Submit data to show that the following items conform to the Specification requirements:

1. Pipe, fittings, and accessories.
2. Connectors to manholes and dissimilar pipe
3. Manhole

C. Submit certified test reports as required herein and by the referenced standards.

PART 2 – PRODUCTS

2.01 GENERAL

A. All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping.

B. Acceptance of materials shall be subject to strength and quality testing in addition to inspection of the complete product. Acceptance of installed piping systems shall be based on inspection and leakage tests as specified in Part 3 of this Section.

2.02 PVC PIPE AND FITTINGS

A. Gravity PVC sewer pipe and fittings shall comply with ASTM D3034, SDR 35. Pipe and fittings shall be furnished with bells and spigots, which are integral with the pipe wall and with a rubber gasket securely, locked in place in the bell. Pipe joints shall use flexible elastomeric gaskets conforming to ASTM D3212.

B. Gravity PVC sewer pipe and fittings for inlet and outlet pipes for the septic tanks shall be Schedule 40 PVC unless otherwise noted on the Plans.

2.03 CALDER-TYPE FLEXIBLE COUPLINGS

A. Flexible couplings shall be Calder-type where specifically indicated in the Plans. Calder-type flexible couplings shall consist of all elastomeric PVC sleeve secured to the pipes with stainless steel clamping bands. Adapter couplings shall be furnished for transitions between piping different outside diameters as necessary.

B. Calder-type flexible couplings shall be as manufactured by Calder Co., Fernco, or approved equal.

2.04 PVC BALL VALVES

A. Ball valves shall be PVC Class 1245 4-B, conforming to ASTM D1784, true union type, threaded per ANSI B1.20.1, full port design, rated 150 psi, Nibco Chemtrol Tru-Block, Asahi/American, or equal.

2.05 PVC SWING CHECK VALVE

A. Check valves shall be True Union Utility Swing Check constructed from PVC Type 1, ASTM D1784 Cell Classification 12454. All union nuts shall have buttress threads coupled to a replaceable sealed unit with EPDM seat and weighted disc. All valves shall have external flow arrow direction designation. All valves shall be pressure rated to 150 psi for water at 73 degrees F in open position and to 75 psi at 73 degrees F backpressure (closed).

2.06 VALVE BOXES

A. Valve boxes shall be furnished and installed with all valves installed underground, two-piece adjustable cast iron valve boxes with a minimum inside diameter of 5 inches. The valve boxes shall be set concentric with the axis of the stem and adjusted to the finish grade. Valve boxes shall be East Jordan Iron Work, Inc., 8555 Series with 6800 locking lid or equal.

2.07 CLEANOUTS

A. Cleanouts shall be constructed as shown on the Plans. The cleanout frame and cover shall be 8" x 4" locking cleanout Olympic Foundry, Inc., Part No. M1007 D/T or equal.

2.08 TRACER WIRE

A. Tracer wire shall be 10 GA, THHN solid copper conductor wire.

2.09 WARNING TAPE

A. Warning tape shall be metallic underground warning tape stating "caution buried sanitary sewer lines below."

2.10 PIPE BEDDING

A. Pipe bedding shall be gravel backfill for pipe zone bedding per WSDOT Standard Specifications Section 9-03.12(3).

PART 3 - INSTALLATION

3.01 GENERAL

A. All types of pipe shall be handled in a manner that will prevent damage to the pipe, pipe lining, or coating.

B. Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations, and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and relayed. A clean whiskbroom shall be used for this purpose and for brushing to remove foreign matter prior to joining of pipe ends. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Engineer to ensure cleanliness inside the pipe.

C. Pipe shall be stacked in such a manner as to prevent damage to the pipe, to prevent dirt and debris from entering the pipe, and to prevent any movement of the pipe. The bottom tiers of the stack shall be kept off the ground on timbers, rails, or other similar supports.

3.02 BELL AND SPIGOT PIPING

A. All bell and spigot connections shall be made up in strict compliance with the manufacturer's recommendations and all sewer pipe manufacture and handling shall meet or exceed the ASTM and CPAW recommended specifications, current revisions.

B. Pipe handling after the gasket has been affixed shall be carefully controlled to avoid disturbing the gasket and knocking it out of position, or loading it with dirt or other foreign material. Any gaskets so disturbed shall be removed, cleaned, relubricated if required, and replaced before the rejoining is attempted.

C. Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand,

sling, or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

D. Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instructions provided by the pipe manufacturer. Sufficient restraint shall be applied to the line to assure that joints once home are held so, until fill material under and alongside the pipe has been sufficiently compacted.

E. Dissimilar pipe shall be joined by use of a Calder-type flexible coupling.

F. PVC piping socket weld connections shall be made up as follows:

1. Where pipe is cut, remove all burrs and ream inside to provide smooth flow line. Joints shall be first cleaned with cleaner before making up. Cement both pipe pieces to be joined and join quickly. If joint cannot be made up to full depth of socket, cut out and discard. Wipe off excessive cement. Do not move for 15 minutes after making up joint. Pipe joining below 40 degrees F will not be permitted. Cleaner and cement types shall be as recommended by the manufacturer for the size of pipe being used.

3.03 THREADED PIPING

A. Threads for threaded joint piping shall be neatly cut with sharp tools and jointing procedure shall conform with best practice. Before jointing, all scale shall be removed from pipe by some suitable means such as pounding. After cutting, all pipe shall be reamed. All pipe shall be screwed together with an application of approved pipe compound applied to all male threads. Once a joint has been tightened, it shall not be backed off unless threads are recleaned and new compound applied. This application neatly made; all compound, dirt thoroughly wiped off outside of every joint.

B. Unions shall be installed in all threaded joint piping to facilitate removal of pipe sections for maintenance or repair in accordance with best trade practice. All such unions shall be included in bid price whether shown on the Plans or not.

3.04 VALVES

A. All valves and accessories shall be installed in a manner and location as shown on the Plans or as required for the application and in accordance with manufacturer's instructions. Valve size is fully equal to line piping in which the valve is installed unless otherwise noted on the Plans. Support all valves where necessary. In case of conflict between these Specifications and a governing code, the more stringent standard shall prevail.

B. All valves of the same style or type shall be furnished by a single manufacturer.

C. Provide all accessories necessary for proper valve operation as specified or required for the application. Valve boxes shall be set such that the slots in the boxes are in line with the run of pipe the valves are in.

D. Valves shall be installed with the operator in a position for convenient operation. Any valve which is installed, in the opinion of the Engineer, in a manner that operation is inconvenient shall be modified or removed and reinstalled in a manner suitable to the Engineer at the expense of the Contractor. Operations for manual valves shall be lever or handwheel as is standard with the manufacturer unless another type of operator is specified or required by the manufacturer.

3.05 EXCAVATION

A. All earthwork, excavation, backfill, and compaction shall be as specified in Sections 02310- Backfilling and Grading and 02317-Trenching for Site Utilities.

3.06 TESTING GRAVITY SEWERS

A. The Contractor shall furnish all facilities and personnel for conducting tests. The Engineer shall be notified 48 hours in advance of testing gravity sewers in order to observe the testing procedures. Two options are provided for testing gravity sewers.

1. Low-Pressure Air Test

a. Clean and flush the gravity sewer prior to leakage testing. Check that all valves are closed and/or pipe ends capped. Check to ensure valves are compatible with air testing. The sewer pipe shall be tested for leaks through the use of air in the following manner:

(1) Following the pipe cleaning, utility installation, and paving, the pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 4.0 pounds per square inch greater than the average backpressure of any groundwater that may submerge the pipe. At least 2 minutes shall be allowed for temperature stabilization before proceeding further.

(2) The rate of air loss shall then be determined by measuring the time interval required for the internal pressure to decrease from 3.5 to 2.5 pounds per square inch while maintaining the stipulated pressure greater than the pipe section's average adjacent groundwater backpressure.

b. The pipeline shall be considered acceptable if the total rate of air loss from any section tested in its entirety between manholes, cleanouts, or pipe ends is equal to or greater than the allowable time, as calculated in accordance with Section 7-17.3(2)F of the WSDOT Standard Specifications.

c. If the pipe installation fails to meet these requirements, the Contractor shall determine at his own expense the source or sources of leakage, and he shall repair (if the extent and type of repairs proposed by the Contractor appear reasonable to the Owner) or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of this low-pressure air test before being considered for acceptance.

d. Plugs used to close the sewer pipe for the air test shall be securely braced to prevent the unintentional release of a plug, which can become a

high-velocity projectile. Gauges, air piping manifolds, and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure release device such as a rupture disk or a pressure relief valve designed to relieve pressure on the pipe under test at 6 psi.

2. Water Testing

   a. Gravity sewers shall be tested for the full length by plugging inlet and outlet as required. The pipe shall be filled with potable water to the highest point (cleanout) possible as determined by the elevation of the lowest manhole or opening and allowed to stand full for 2 hours prior to testing.

   b. The water level shall then be brought back up to its highest level and the 1-hour test period started. At the end of 1 hour, the amount of water necessary to bring the level back to the highest level shall be accurately measured to determine leakage. Maximum allowable leakage will be 50 gallons per inch diameter per mile per day. No special allowance will be made for manholes.

   c. Potable water for gravity sewer test will be provided by the Owner.

3.07 TRACER WIRE/WARNING TAPE

A. Tracer wire and warning tape shall be installed the entire length of the sanitary sewer pipe. Tracer wire shall be installed 6 inches above the pipe and warning tape shall be installed 2 feet below finished grade. Tracer wire shall be terminated at cleanout and valves.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02601

CEMENT CONCRETE PAVEMENT

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. References
C. System Description
D. Quality Assurance
E. Materials
F. Installers
G. Examination
H. Preparation
I. Construction
J. Repair/Restoration
K. Adjusting
L. Protection

1.02 SUMMARY

A. Section includes the following:

1. Cement Concrete Sidewalks.
2. Cement Concrete Driveway Approach.

B. Related Sections:

1. 02060 – Aggregate Material
2. 02611 – Asphalt Concrete Paving
3. 02310 – Backfilling and Grading

1.03 REFERENCES

A. WSDOT/APWA Standard Specifications for Road, Bridge, and Municipal Construction, 2008 M41-10.

B. King County Road Standards, 2007.

1.04 SYSTEM DESCRIPTION

A. Provide the following types of sidewalk or approach in the locations indicated on the Plans:

1. Cement Concrete Sidewalk as illustrated in the Plans.
2. Cement Concrete Driveway approach as illustrated in the Plans.

1.05 QUALITY ASSURANCE

A. Subcontractor Qualifications:

1. Workers Qualifications: To be qualified and competent.

B. Regulatory Requirements: In accordance with Section 01410 - Regulatory Requirements.

C. Work under this section shall conform to King County Road Standards, WSDOT Standard Specifications 8-06 and 8-14, and these specifications.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials: in accordance with WSDOT Standard Specifications, King County Road Standards and items noted in the Plans.

1. Concrete for sidewalks and approaches shall be Class 4000. Cold and hot weather precautions as set forth in WSDOT/APWA Standard Specifications Sections 5-05.3(14) and 6-02.3(6) A shall apply.
2. All sidewalks adjacent to Cement Concrete Curb and Gutter or Vertical Curbs shall be 4-inches thick unless otherwise noted in the Plans.
3. All driveway approaches adjacent to Mountable Curb and Gutter or Depressed Cement Concrete Curb and Gutter as illustrated in the Plans shall be 5 inches thick.

PART 3 EXECUTION

3.01 INSTALLERS

A. Installer is required to be experienced in work of the scope and quality indicated, with a record of successful in-service performance.

3.02 EXAMINATION

A. Verify conditions are satisfactory to receive work of this Section. Do not commence work until unsatisfactory conditions have been corrected.

B. Beginning work constitutes acceptance of conditions.

3.03 PREPARATION

A. Field Measurements: Verify on job before beginning work.

B. Protect surrounding areas and surfaces from damage prior to beginning work of this Section.

3.04 CONSTRUCTION

A. Construct cement concrete sidewalks and driveway approaches per WSDOT Standard Specifications, King County Road Standards, and as illustrated on the Plans.

3.05 REPAIR/RESTORATION

A. Repair or restore any sidewalk or approach to remain which is damaged during construction, including cracking or excessive settlement. The Engineer shall note all locations that are damaged and require repair.

1. Remove the damaged section.
    a. Remove to an adjacent expansion joint, or saw cut a neat line.
2. Replace with new Work conforming to the requirements of this Section and matching the adjacent Work.
3. Remove and replace segments such that adjacent joints are no closer than seven (7) feet, or matching existing conditions if less than seven (7) feet.

3.06 ADJUSTING

A. Where new work will abut existing work, adjust work to match existing at the transition.

3.07 PROTECTION

A. Protect work of this Section from damage and deterioration until completion and acceptance by Owner.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02611

ASPHALT CONCRETE PAVING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. References
C. Submittals
D. Quality Control
E. Project Conditions
F. Source Quality Control
G. Bituminous Prime and Tack Coats
H. Asphalt Concrete Pavement Surface Course
I. Field Quality Control
J. Preparation
K. Asphalt Concrete Pavement Construction
L. Maintenance and Protection

1.02 SUMMARY

A. Section includes materials and placement requirements for asphalt concrete paving, also referred to in the Specification and Plans as hot mix asphalt (HMA). Contractor shall conform to the requirements within WSDOT Standard Specification 5-04, "Hot Mix Asphalt."

B. Related Sections:

1. 02060 – Aggregate Material
2. 02310 – Backfilling and Grading
3. 02622 – Pavement Markings

1.03 REFERENCES

A. Washington State Department of Transportation (WSDOT), "Standard Specifications for Road, Bridge, and Municipal Construction, 2012" M 41-10.

1.04 SUBMITTALS

A. Contractor shall conform to the requirements in section 01330- Submittal Procedures.

B. Submit the following information to the Engineer, for review and approval, no later than fourteen (14) calendar days prior to scheduled delivery of specified materials to the Site:

1. Material list for items proposed to be provided under this Section.
2. Job-mix formula for asphaltic concrete surface course.
3. Certificates, signed by the material producer, indicating that the materials meet or exceed the specified requirements.

C. Submit one (1) copy of the truck ticket for every load of asphaltic concrete delivered to the Site.

D. Progress Submittals:

1. Submit, within seven (7) days after the date of placement, results of field quality control testing.

1.05 QUALITY CONTROL

A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with WSDOT.
2. Contractor shall retain the services of an approved QC Firm to determine conformance of the materials and constructed Work with the Specifications.

1.06 PROJECT CONDITIONS

A. Asphaltic concrete pavement shall be placed only during periods of acceptable weather conditions in accordance with the requirements of the WSDOT 2012 Standard Specifications.

B. Pavement markings shall be placed only during periods of acceptable weather conditions in accordance with the requirements of the WSDOT 2012 Standard Specifications.

PART 2 – PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Proposed materials and source of supply shall be approved by the Engineer as specified prior to delivery of materials to the Site and use of the materials in the construction.

2.02 BITUMINOUS PRIME AND TACK COATS

A. Bituminous prime and bituminous tack coat materials shall conform to the WSDOT 2012 Standard Specifications.

2.03 ASPHALTIC CONCRETE PAVEMENT SURFACE COURSE

A. Surface course shall be HMA and conform to Section 5-04 of the WSDOT Standard Specifications.

B. Grade of HMA shall conform to grade specified in the Plans.

PART 3 – EXECUTION

3.01 FIELD QUALITY CONTROL

A. Tests specified in the following paragraphs shall be performed by the QC Firm during construction of the asphaltic concrete pavement.

B. Density Testing (during the Compaction Process):

1. Acceptance of each day's placement of asphaltic concrete shall be determined by using a nuclear densitometer. The density shall be determined by a licensed nuclear gauge operator conducted in presence of the Engineer/Engineer's Representative, using the procedure described in ASTM D2950. The Engineer shall specify the location and number of tests to be performed during paving operations.
2. Pavement areas where the density falls below the specified range shall be re-compacted until the required density is obtained.

C. Surface Tolerance: Test the finished surface of asphaltic concrete with a straightedge while being rolled. Deviations greater than the tolerances allowed by WSDOT 2012 Specifications shall be corrected using methods approved by the Engineer.

D. Tests for Depth: The depth of asphalt pavement shall be carefully controlled, with periodic measurements of the loose and compacted depths.

3.02 PREPARATION

A. Paving operations shall only be initiated after all subsurface structures are placed and the Aggregate Base Course has been graded to proposed sections shown on the Plans.

B. Pavement marking shall only be initiated after the requirements of Section 8-22 of the WSDOT Standard Specifications have been met and approved by the Engineer.

3.03 ASPHALT CONCRETE PAVEMENT CONSTRUCTION

A. HMA shall be constructed in conformance with the applicable requirements of WSDOT 2012 Specifications and as specified in the following paragraphs.

B. Surface course for all on-site roadways shall be placed in 1 lift to achieve a total compacted thickness of 2 inches. The depth of the pavement surface course shall be carefully controlled, with periodic measurements of the loose and compacted depth.

C. Final pavement surface shall be constructed to the grade and cross-section matching the pavement surface shown on the plans. Finish surface at junction with existing pavement to provide smooth transition.

D. Final pavement surface at the roundabout transitions and circulation lane shall be smooth and within the specified tolerance presented in 3.01 of this Section.

3.04 MAINTENANCE AND PROTECTION

A. The completed pavement surface shall be protected from damage until acceptance of the pavement replacement Work.

B. Damaged areas shall be repaired using methods approved by the Engineer.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02622

PAVEMENT MARKINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. References
C. System Description
D. Quality Assurance
E. Material
F. Installers
G. Examination
H. Preparation
I. Construction

1.02 SUMMARY

A. Section includes specifications for providing and removing temporary/permanent plastic and painted pavement markings on pavement surfaces.

B. Related:

1. Section 01410 – Regulatory Requirements

2. Section 02611 – Asphalt Concrete Paving

1.03 REFERENCES

A. Comply with the requirements of Section 01410 Regulatory Requirements, References, and as listed herein. The following is a list of standards referenced in this Section:

1. WSDOT/APWA Standard Specifications for Road, Bridges, and Municipal Construction, 2008 M41-10.
2. WSDOT/APWA Standard Plans for Road, Bridges, and Municipal Construction, M 21-01 and as indicated in the Plans.

1.04 SYSTEM DESCRIPTION

A. Provide the following types of pavement markings in the locations indicated on the Plans:

1. Yellow paint line.
2. White paint line.
3. Yellow skip line.
4. Thermoplastic crosswalk line.
5. Thermoplastic ADA symbol.
6. Yellow skip line with raised pavement markings

1.05 QUALITY ASSURANCE

A. Subcontractor Qualifications:

1. Workers Qualifications: To be qualified and competent.

B. Regulatory Requirements: In accordance with Section 01410 - Regulatory Requirements.

PART 2 – PRODUCTS

2.01 MATERIALS

A. The materials used for pavement markings, including paint, beading, thermoplastic, and pressure-sensitive tape shall conform to the applicable sections of WSDOT Standard Specifications Section 9-34, Pavement Marking Material, unless indicated otherwise.

PART 3 – EXECUTION

3.01 INSTALLERS

A. Installer is required to be experienced in work of the scope and quality indicated, with a record of successful in-service performance.

3.02 EXAMINATION

A. Verify conditions are satisfactory to receive work of this Section. Do not commence work until unsatisfactory conditions have been corrected.

B. Beginning work constitutes acceptance of conditions.

3.03 PREPARATION

A. Field Measurements: Verify on job before beginning work.

B. Protect surrounding areas and surfaces from damage prior to beginning work of this Section.

3.04 CONSTRUCTION

A. The work described in this Section shall be performed in accordance with the applicable subsections of WSDOT 8-22, Pavement Marking.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02670

WELL CONSTRUCTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Definitions
C. Description of the Well Installation
D. Submittals
E. Materials
F. Construction
G. Field Quality Control

1.02 SUMMARY

A. These specifications cover the drilling and development of the injection, recovery, and monitoring wells on the project. This work is inclusive of the labor, equipment, and materials required for the drilling, well installation, site access/controls/restoration, and tests. These specifications detail the materials, construction, and testing for the wells presented on Plan Sheet PC-103, and is part of the contract and agreement to perform and complete the work as specified herein.

B. The construction shall conform to Washington Administrative Code (WAC) 173-160 (*Minimum Standards for Construction and Maintenance of Wells*). The State of Washington (WAC 173-160) regulations require that all wells be installed and abandoned by a licensed water well driller. Therefore, a licensed water well driller must be onsite to oversee or perform the work at installation and abandonment. The State also requires start cards and abandonment submittals that are performed by the licensed water well driller.

C. Access around and within the building structure is critical and is shown in the Plans. The contractor must have small, portable equipment that can enter the building and perform the work. This work must be coordinated with the concrete coring / removal and pipe / vault installation.

D. The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work.

1. Section 02060 – Aggregate Materials
2. Section 02150 - Geotechnical Instrumentation and Monitoring.

1.03 DEFINITIONS

A. Aquifer: Rock or sediment in a formation, group of formations, or part of a formation that is saturated and sufficiently permeable to transmit water to wells and sumps.

B. Dewatering System: System typically composed of pumping wells that will lower the groundwater table or potentiometric surface to adequately to permit safe and dry construction.

C. Groundwater: Water that flows primarily in response to gravitational forces in fully saturated soils, sediments, and rocks below the ground surface.

D. Groundwater Table/Level: A particular potentiometric surface for an aquifer.

E. Injection Wells: Designed to inject water into the subsurface to maintain groundwater levels at the pre-dewatering static levels.

F. Impermeable Materials: Materials with a low permeability that do not allow water to flow freely (e.g. clay).

G. Monitoring Well: A non-pumping well used to observe the elevation of the groundwater table and/or allow sampling of the groundwater.

H. Open Sump Pumping: The use of sump pumps to remove surface water without using a temporary screen or slotted casing surrounded with filter material.

I. Permeability: The property of sediments and rocks that allows the movement of water through them (also known as hydraulic conductivity). It is measured as a flow rate or speed of water moving through the formation.

J. Potentiometric Surface/Level: The theoretical (imaginary) surface of the static head of groundwater in an aquifer. The groundwater table is a particular potentiometric surface for an aquifer.

K. Recharge System: A system that maintains the groundwater table, piezometric, or potentiometric surface at or near pre-dewatering static levels.

L. Sand/Gravel Pack: A sand or gravel material which is placed in the annular space between a drilled hole and the well casing and/or well screen. Typically this 'Pack' has a higher permeability than the aquifer.

M. Screen (well screen): A cylinder of steel or plastic material used to allow water to enter a well while preventing the majority of the sediment or rock particles from entering the well.

N. Screen Slot Size: The width of screen slots which vary are unique to a specific screen. Typically the proper slot size should be one that retains, or keeps out, 50% to 75% of the particles composing the aquifer. By practice, a uniform grain size aquifer can allow more particles through than a well-graded one. The particles are brought into the well by the development process and disposed of.

O. Solids: The matter that is suspended in the water or dissolved in the water.

P. Subgrade: The finished grade level of an excavation as shown on the Drawings, including excavation for foundation preparation.

Q. Shallow sump well system: A shallow hole or trench in the ground in the excavation with a slotted or perforated casing containing a pump and surrounded by filter sand or gravel to prevent the pumping of formation material.

R. Vacuum Well: A short slotted or perforated screen (usually steel or plastic and generally less than 4 inches in diameter and less than 5 feet long) attached to a 15 to 25 foot long riser pipe and typically jetted, driven, or installed in a filter packed drilled hole then connected to a vacuum header. Each vacuum well has a drawtube near the bottom of the screen on the inside so that water can be vacuumed all the way to the bottom.

S. Vacuum Well System: The system that consists of a number of vacuum wells placed at close intervals (3 to 10 feet typically) along the exterior of the excavation and attached to a common header that is pumped by a vacuum system pump that can deliver 80% of a perfect vacuum at the pump.

T. Well Development: The method of using swabbing, surging, jetting, resonance, and/or pumping techniques to:

1. Clean drilling debris from the well and the surrounding formation.
2. Repair damage done by drilling to the formation.
3. Remove biological or chemical encrustation from the well screen.
4. Enhance the hydraulic connection between the well screen and the formation by bringing a percentage of the fines in the aquifer formation into the properly sized well screen so that a more open filter pack is obtained around the well screen. A technique to move water or air out through the screen and then back into the well quickly is common. Also required is a means to remove or control the fines.

1.04 DESCRIPTION OF WELL INSTALLATION WORK

The drilling method shall be specified by the contractor, and shall meet the requirements of this specification, WAC 173-160, and scheduling requirements. The work to be conducted under these specifications includes:

1. Mobilize to the drilling site. The well sites shall be inspected prior to mobilization by the contractor to determine if the well site is capable of supporting drilling equipment and minimizing erosion. Any improvements to make the well site more accessible shall be responsibility of the contractor.
2. Drill the wells in the location generally as shown on Plan Sheet PC-101, unless agreed upon with the engineer.
3. Construction the wells per the plans using the materials and sizes specified on Plans
4. Dispose of cuttings and restore the drill sites per direction of the engineer.

1.05 SUBMITTALS

A. Procedures: Section 01330 - Submittal Procedures.

B. A minimum of three weeks prior to installation of any wells, submit the following:

1. General construction sequence of all wells, including the interior and exterior wells.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Furnish all materials, tools, equipment, facilities, and services as required for providing the necessary wells given in the plans.

PART 3 – EXECUTION

3.01 CONSTRUCTION

A. Well Drilling & Screen/Casing Placement.

1. Perform the drilling in a continuous manner until the well depth is reached.
2. The cuttings and drilling fluid from the boring process shall be contained neatly at the well site so other areas within or around the facility are not damaged.
3. Excess materials, including the material from the boring, shall be removed from the building and disposed of offsite.

B. Develop all well installed. The development process can be aggressive and can vary depending on the well in question.

1. Well development in all wells shall be considered complete when:

a. A minimum of five well volumes have been removed.
b. The sand content of the discharge water does not exceed five parts per million as determined by a Rossum Sand Tester, Imhoff Cone method, or other approved method.
c. The discharge water meets all discharge permit requirements for turbidity and settleable solids.
d. The material brought into the well must be removed from the bottom of the screen either by air or water lifting techniques or bailing. A blank section of pipe at the bottom of well commonly called a 'tail' can be used as a place where solids will fall and be below the screen level. The intent of this section is to not have material inside the well casing blocking the screen.

3.02 FIELD QUALITY CONTROL

A. Records

1. Prepare a drillers log of the well materials and the materials placed for submittal to the Resident Engineer at end of well construction.
2. Observe and record the elevation of the groundwater at the end of drilling. Submit observation records to the Resident Engineer within 24 hours of reading.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 02810

IRRIGATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Automated Irrigation System Description
C. Temporary Irrigation Description
D. Submittals
E. Quality Assurance
F. Manufacturers
G. Piping and Fittings
H. Valves
I. Miscellaneous
J. Preparation
K. Installation
L. Field Quality Assurance
M. Record Document Drawings

1.02 SUMMARY

A. Following intrusive construction the Contractor shall restore the existing irrigation system to serve existing landscaped areas. Service, and or provide new, a programmable, automatically controlled underground sprinkler irrigation system for landscape plantings, including piping and fittings, backflow prevention, control system, and accessories, as required for a complete finished, operational installation.

B. Provide temporary irrigation of all sod areas within the School property during 2015 summer construction.

C. Related Sections:

1. Section 01330– Submittal Procedures

2. Section 01500 – Temporary Facilities

D. References:

1. Schoolyard Irrigation System As-built, August 2013 (Provided as attachment).

1.03 AUTOMATED IRRIGATION SYSTEM DESCRIPTION

A. Design Requirements:

1. Code Compliance: Irrigation system shall comply with all applicable governing codes.

2. Design sprinklers for head-to-head coverage to achieve uniform application of water throughout a planting area.

3. Backflow prevention: Ensure backflow preventer is installed and functional downstream of point of connection for water supply complying with State and local codes.

4. Provide a system with components produced by manufacturers matching the standard irrigation equipment being used by the School, including heads, valves, piping circuits, controls and accessories, or approved equal.

B. Performance Requirements:

1. Shall provide 100% coverage of schoolyard areas.

1.04 TEMPORARY IRRIGATION DESCRIPTION

A. Provide temporary irrigation of all non-disturbed grass areas on School property. Any grass areas on School property not irrigated during construction shall be treated as disturbed and replaced with Sod as described in Section – 02920 Sod and Hydroseeding.

B. Temporary irrigation events shall occur in the morning no less than twice per week.

1.05 SUBMITTALS

A. A temporary irrigation execution plan, which outlines scheduling, system coverage, and piping circuits for temporary irrigation shall be submitted for contractor approval prior to mobilization.

B. Product Data: Submit manufacturer's technical data and installation instructions.

C. Shop Drawings: Submit shop drawings showing plan layout, location, and type of heads, valves, piping circuits, controls, and accessories. Include flow calculations for each remote control valve.

D. Record Drawings.

1.06 QUALITY ASSURANCE

A. Irrigation contractor/installer: Is required to be a company specializing work of irrigation systems, with minimum of 5 years documented experience in irrigation installation of a similar nature.

B. Warranty: Work of this section shall be warranted for one year from the date of final acceptance against all defects of materials and workmanship. Irrigation equipment damaged by vandalism or resulting from School occupancy of the site will not be required to be replaced under this warranty, unless improper installation is a contributing factor in the damage, i.e. heads at improper elevation, irrigation piping at improper depths etc.

PART 2 – PRODUCTS

A. Material within disturbed areas shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system.

2.01 MANUFACTURERS

A. Procure irrigation system's components from established firms with a minimum of five years of experience in manufacturing irrigation system materials.

2.02 PIPING AND FITTINGS

A. PVC pipe and fittings shall comply with requirements of WSDOT Standard Specifications for Road, Bridge, and Municipal Construction, 2012 Section 9-15.1(2).

B. All pipe and fittings shall have a guaranteed working pressure of 150 pounds per square inch (PSI) continuously applied.

C. All pipes shall have the same schedule fitting as the pipe it connects to, existing pipe is Schedule 40 PVC.

D. Mainline shall be buried to a depth of 24" below finish grade. Lateral line shall be buried to a depth of 18" below finish grade. Horizontal pipe shall be located beneath geomembrane liner.

2.03 VALVES

A. Control valves shall comply with the requirements of WSDOT Standard Specifications for Road, Bridge and Municipal Construction, 2012 Section 9-15.7(2) Automatic Control Valves.

2.04 MISCELLANEOUS

A. Controller wires shall be taped to irrigation main or lateral lines where possible. If not available, wires to controller shall be placed in 1" /1.5" sleeve.

B. Control wire must be insulated copper type UF No. 14 single strand, UL approved for 24-50 volts.

PART 3 – EXECUTION

3.01 PREPARATION

A. Locate and flag the exact locations of all existing sprinkler heads and connection piping.

B. Pothole existing lateral irrigation pipe as needed to confirm depth and potential conflict to site work.

3.02 INSTALLATION

A. Depth: Main line shall be minimum 24 inches deep with cover over pipe. Laterals shall be minimum 18 inches deep with cover over pipe (unless otherwise indicated on the Plans).

B. Trenches shall be a minimum 6 inches wide with straight runs, bottom shall be smooth and free of stones over 1-inch in diameter.

C. Install per WSDOT Standard Specifications 2012 8-03.3 Irrigation Systems Construction Requirements.

3.03 FIELD QUALITY ASSURANCE

A. Automated Irrigation System Field Testing:

1. To be valid, tests must be performed under the direction of the Engineer. Give 72 hours notice to the Engineer when inspection is desired.

2. The Engineer reserves the right to direct the removal and replacement of items which, in the Engineer's opinion, does not present an orderly, reasonably neat or workmanlike appearance, provided such items can be properly installed in such an orderly way by the usual methods in such work. Such removal and replacement shall be done, when directed in writing, at the Contractor's own expense without additional cost to the Owner or the Engineer.

3. Gauges used in the testing of water pressures shall be certified correct by an independent testing laboratory immediately prior to use on the project. Gauges shall be retested when directed by the Engineer, at no additional cost to the Owner or the Engineer.

B. Preliminary Inspection/Leak Testing:

1. Prior to requesting inspections by the Engineer, accomplish the following:

a. Conduct a preliminary test and make adjustments required. Request tests for mains only after mains have been installed and tested.

b. Assure all pipe and valves (including quick coupling valves) and other equipment, except sprinkler heads, are in place.

c. Cap sprinkler risers, except first riser from valve, on each lateral (one uncapped riser per lateral), typical.

d. Purge air from main lines.

2. Test laterals as follows: Purge air from laterals and cap risers. Open valves and bring system to line pressure. Lateral lines will be inspected visually. Lines which evidence visible leakage shall be rejected.

3. Rejected systems: Rejected systems or portions of systems require repair and retesting in manner specified.

C. Coverage Check: Operate each zone of the system for the Engineer's inspection.

D. Temporary Irrigation System:

1. Prior to any demolition of the existing irrigation system the contractor shall demonstrate full irrigation of School Property outside area of construction using temporary irrigation system.

2. The Contractor shall maintain a full functional temporary irrigation system until Field Testing of Automated Irrigation System has been completed.

3.04 RECORD DOCUMENT DRAWINGS

A. Record all changes that have been made during actual installation of the irrigation system. Clearly indicate any such changes on a record set of drawings immediately upon installation of any piping, valves, wiring, sprinkler heads, etc., in locations other than shown on the original drawings, or of sizes other than indicated.

END OF SECTION 02810

BNSF – Skykomish School HWF Remediation

SECTION 02920

SOD AND HYDROSEEDING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Delivery, Storage and Handling
C. Existing Conditions
D. Materials
E. Preparation of subsoil
F. Fertilizing
G. Sod Installation on School Property
H. Hydroseeding
I. Maintenance and Warranty Program

1.02 DELIVERY, STORAGE, AND HANDLING

A. Deliver sod on pallets. Protect exposed roots from dehydration.

B. Do not deliver more sod than can be laid within 24 hours

1.03 EXISTING CONDITIONS

A. All existing grass areas on School Property which are damaged or destroyed during construction are to be replaced with new sod of the same variety, unless otherwise noted, which existed prior to construction.

B. All existing grass areas outside School Property which are damaged or destroyed during construction are to be replaced with hydroseed of the same variety, unless otherwise noted, which existed prior to construction.

C. In all cases, Contractor is responsible for the restoration of the grass to the conditions that existed prior to construction.

D. All areas within the limits of construction or disturbed by construction on School Property shall be sodded with Bahia unless a separate ground cover is specified on the drawings.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: Muck; free of plants, weeds, and roots.

B. Sod: Bahia. Live, fresh, and uninjured at time of planting, free of objectionable weeds, and have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. Transport within 24 hours after being stripped and plant as soon as possible.

C. Water: Free of excess and harmful chemicals, acids, alkalies, or any substance which might be harmful to plant growth. Salt water not allowed.

D. Seed muust meet the following specification:

Common Name	Percent By Weight
Colonial bentgrass	10%
Tall or Red fescue	40%
White clover	10%

Meadow or Pacific fox-tail, Timothy, or Redtop may also be used. Alternative seed mixtures may be used as approved in writing by the Engineer.

Materials shall meet WSDOT 2014 Standard Specifications 9-14.2 Seed and 9-14.4(2) Hydraulically Applied Erosion Control Products (HECPs) requirements.

PART 3 EXECUTION

3.01 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated soil.

3.03 FERTILIZION

A. Fertilization applications shall be approved by the Engineer before being applied.

B. Chemicals or Herbicides shall not be applied unless pre approved by Engineer.

3.04 SOD INSTALLATION ON SCHOOL PROPERTY

A. Moisten prepared surface immediately prior to laying sod.

B. Place sod on the prepared surface with edges in close contact and embed firmly and smoothly by light tamping with appropriate tools.

C. Do not stretch or overlap sod pieces.

E. In order to prevent erosion caused by vertical edges at the outer limits, tamp the outer pieces of sod so as to produce a feather edge effect.

G. After installation, saturate sod with water to a depth of 4 inches into the soil.

H. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

I. After rolling, keep sod moist for the duration of the contract period and in no case less than 2 weeks. The moistened condition should extend at least to the full depth of the rooting zone.

3.05 HYDROSEEDING

A. Hydroseed will be be applied to all previously grassed areas outside School Property.

B. Hydroseed must be at a rate of 120 lbs/acre or at a rate approved in writing by the Engineer.

C. Hydroseed application shall meet WSDOT 2014 Standard Specifications 8-01.3(2)B Seeding and Fertilizing requirements.

3.06 MAINTENANCE AND WARRANTY PROGRAM

A. Maintain sodded areas immediately after placement for at least one (1) mowing.

B. Sod at the School must be maintained through August 2016 with 100% survival through August 2016. Any areas of sod which do not survive must be replaced at the Contractor's expense.

END OF SECTION 02920

BNSF – Skykomish School HWF Remediation

SECTION 03301

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Submittals
C. Quality Assurance
D. Formwork
E. Concrete Materials
F. Admixtures
G. Related Materials
H. Curing Materials
I. Concrete Mixtures
J. Concrete Mixing
K. Formwork-Execution
L. Vapor Retarders
M. Joints
N. Concrete Placement
O. Finishing Formed Surfaces
P. Finishing Unformed Surfaces
Q. Concrete Protecting and Curing
R. Field Quality Assurance
S. Repairs

1.02 SUMMARY

A. This Section specifies cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes, for noncritical applications of concrete and for projects using small quantities of concrete, including interior floor slab trench and utility box slab infill.

B. Related Sections include the following:

1. Section 02310- Backfill and Grading

1.03 SUBMITTALS

A. General: In addition to the following, comply with submittal requirements in ACI 301.

B. Product Data Design Mixtures: For each concrete mixture.

C. For each type of product indicated.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

C. Comply with ACI 301, "Specification for Structural Concrete," including the following sections, unless modified by requirements in the Contract Documents:

1. "General Requirements."
2. "Formwork and Formwork Accessories."
3. "Concrete Mixtures."
4. "Handling, Placing, and Constructing."

D. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

PART 2 – PRODUCTS

2.01 FORMWORK

A. Furnish formwork and formwork accessories according to ACI 301.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, Type I

B. Normal-Weight Aggregate: ASTM C 33, graded, 1-1/2-inch nominal maximum aggregate size.

C. Water: ASTM C 94/C 94M potable.

D. Synthetic Fiber: polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type I, 1/2 to 1-1/2 inches long

2.04 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II

2.05 RELATED MATERIALS

A. Vapor Retarder: Multi-ply reinforced polyethylene sheet, ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

B. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

C. Polyurea Joint Filler: 2-component, semirigid, 100 percent solids, polyurea resin with a Type A Shore durometer hardness of at least 80 per ASTM D 2240.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:
   a. ASTC Polymers; Penetron 3003.
   b. ChemCo Systems; CCS Grout, Polyurea Control Joint or SWL.
   c. Dayton Superior Corporation; Joint Saver II.
   d. Euclid Chemical Company (The); Euco Qwikjoint 200.
   e. MBT Protection and Repair, Div. of ChemRex; Masterfill 400 CT.
   f. Metzger/McGuire; Spal-Pro RS 88 or Spal-Pro 2000.
   g. Sonneborn, Div. of ChemRex; Sonolastic TF-100.

D. Hydrophilic Water Stop: Grace Adcore ES System.

2.06 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

E. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.07 CONCRETE MIXTURES

A. Comply with ACI 301 requirements for concrete mixtures.

B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 5 inches plus or minus 1 inch.
4. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of floor slabs to receive troweled finishes to exceed 3 percent.

C. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate but not less than a rate of 1.0 lb/cu. Yd.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure

PART 3 – EXECUTION

3.01 FORMWORK

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.02 VAPOR RETARDERS

A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.

1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or joint tape

3.04 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Locate and install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated

E. Perimeter Joints at Floor Slab Trench Infill: Saw cut or tool perimeter joint per Contraction Joints in Slabs-on -Grade. Fill joint with Poly-urea joint filler. Install joint fill full width and depth of joint and terminate flush with finished concrete slab surface. Coordinate joint depth with installation of continuous strip Hydrophilic Water Stop. Install water stop per manufacturers recommended installation practices including surface preparations, fasteners and application of water stop adhesive.

3.05 CONCRETE PLACEMENT

A. Comply with ACI 301 for measuring, batching, mixing, transporting, and placing concrete.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

C. Do not add water to concrete during delivery, at Project site, or during placement.

D. Consolidate concrete with mechanical vibrating equipment.

3.06 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ½ inch.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.

1. Apply to vertical concrete surfaces exposed to public view.

C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed finished as-cast concrete where indicated:

1. Smooth-rubbed finish.
2. Grout-cleaned finish.
3. Cork-floated finish.

D. Related Unformed Surfaces: At horizontal offsets and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.07 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.

1. Do not further disturb surfaces before starting finishing operations.

C. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

F. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.08 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial

application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.09 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Tests: Perform according to ACI 301.

1. Testing Frequency: One composite sample shall be obtained for each day's pour of each concrete mix exceeding 2 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: One composite sample shall be obtained for each 50 cu. yd. or fraction thereof of each concrete mix placed each day.

3.10 REPAIRS

A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 09910

PAINTING

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Summary
B. Submittals
C. Quality Assurance
D. Delivery, Storage, and Handling
E. Project Conditions

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete Floor Slabs
2. Painting of miscellaneous adjacent finish surfaces damaged by construction work, including walls, doors and frames, trim and windows.

1.3 SUBMITTALS

A. Samples for Verification:

For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.
5. Paint samples to be applied to surface similar to surface to be painted.
6. Verify Steel primer is compatible with Intumescent Paint specified in this section.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
3. Employ an independent testing agency to test and verify the thickness of Intumescent Paint.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees Fahrenheit (7 degrees Celsius).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees Fahrenheit (10 and 35 degrees Celsius).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 degrees Fahrenheit (3 degrees Celsius) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Benjamin Moore & Co.
2. ICI Paints.
3. Kelly-Moore Paints.
4. Rodda Paint Co.
5. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for volatile organic compound (VOC) content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

1. Flat Paints and Coatings: VOC content of not more than 50 grams per liter.
2. Nonflat Paints and Coatings: VOC content of not more than 150 grams per liter.

3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
4. Restricted Components: Paints and coatings shall not contain any of the following:

a. Acrolein.
b. Acrylonitrile.
c. Antimony.
d. Benzene.
e. Butyl benzyl phthalate.
f. Cadmium.
g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

C. Colors: As selected by School's Representative from manufacturer's full range.

2.3 INTERIOR PAINT SCHEDULE

A. Systems and glass levels are found in the MPI, APSM.

B. Concrete Floor: Int. 3.2A, Latex Floor Enamel, Low Gloss, Budget Grade. Typical UNO.

C. Appropriate MPI Systems as selected by School's Representative for the painting of adjacent surfaces damaged by construction, including but not limited to the following.

a. Plaster/Gypsum WallBoard: Int. 9.2M, Latex Low Odor/VOC. Gloss Level 3, Budget Grade.

b. Wood Doors and Frames, Wainscot and Trims: Int. 6.3Y, Polyurethane (over semi-transparent stain, flat), Budget Grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Gypsum Board: 12 percent.

C. Clean surfaces of grease, dirt, or other debris.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

G. Aluminum Substrates: Remove surface oxidation.

H. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint finished surfaces edge to edge within room to avoid the appearance of patching.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Engineer, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

E. Take care to ensure Intumescent paint is not damaged during the course of construction. Prior to installing ceilings, inspect Intumescent Paint and if damaged areas are noted, reapply intumescent paint at any damaged areas.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 11200

MODULAR HOT WATER FLUSH SYSTEM

PART 1 – GENERAL

1.01 SUMMARY

A. A HWF system shall be constructed at the Skykomish School to remove residual No. 6 bunker oil from the soils underneath the school to the extent technically possible. Introduction of hot water will decrease the viscosity of the residual oil, and the hydraulic gradient induced by water injection and groundwater extraction will promote the flow of residual oil to a series of groundwater extraction wells and oil skimmers. Key components of this system include a hot water boiler, injection pipes installed beneath the school floor, associated monitoring systems (water temperature, subsurface temperature, groundwater level, sub-slab pressure differential, and indoor air condition), a groundwater extraction trench, groundwater extraction pumps, oil skimmers, treatment of extracted groundwater, and a water chiller for removing excess heat from the extracted water, when necessary.

B. Associated with the HWF system is a soil vapor extraction (SVE) system designed to prevent hydrocarbon vapor infiltration through the school floor and to remove excess heat generated by the hot water injection. Related systems include a carbon adsorption system for removal of trace hydrocarbon vapors prior to direct discharge.

C. The HWF system and SVE systems are modular. Modules include an SVE/Equipment Enclosure with a control room, water treatment module, boiler module, and chiller module. These systems have been modularized to facilitate construction and HWF system operations, which will conducted in phases.

D. HWF system operations will occur during the summer only, when school is not in session. Required modules include the SVE/Equipment Enclosure, water treatment, and boiler modules. At the end of the HWF system summer heating phase and start of the CWF cooling phase, the boiler module operation will cease, and the chiller module operation will be initiated, which will provide cool water for injection under the school. The water treatment module will still be used during the cooling phase, which is expected to last several weeks.

E. CWF system operations will occur during the fall/winter/spring, when school is in session. At the end of the cooling phase, CWF will continue without active cooling (the chiller will be disconnected from the treatment system). CWF will continue throughout the school year. However, CWF operations may be terminated during periods of high groundwater that may occur in the winter and spring. When CWF operations are discontinued, all modules except for the SVE/Equipment Enclosure will be shut down. The SVE system will continue to function throughout the duration of the project unless SVE operations also are impacted by high groundwater levels.

F. A backup generator will be installed to provide backup power to the SVE/Equipment Enclosure.

G. This section of the specifications provides the general requirements for the constituent modules, including the SVE/Equipment Enclosure, water treatment module, and the boiler and chiller modules.

H. The treatment area is located south of the school, as shown on sheets PC-101 and PC-102.

I. Related Sections:

1. Section 13220 – Vapor Phase Carbon
2. Section 13803 – Programmable Controllers
3. Section 13900 – Oil Skimmers
4. Section 15128 – Flow Measurement
5. Section 15518 – Boilers
6. Section 15540 – Water Pumps
7. Section 15662 – Chillers
8. Section 15710 – Air to Air Heat Exchanger
9. Section 15715 – Air to Water Heat Exchanger
10. Section 15830 – Blowers
11. Section 16050 – Basic Electrical
12. Section 16060 – Power and Standby Power
13. Section 16231 – Standby Generator

1.02 PROJECT CONDITIONS

A. Contractor shall provide all labor, materials, and equipment related to the implementation of the HWF system modules, their interconnection, and their operation.

B. Groundwater heated by a modular boiler system to a maximum temperature of 160 degrees Fahrenheit will be injected into the subsurface of the Skykomish School using a series of injection wells.

C. Groundwater will be extracted using a series of groundwater extraction pumps, cooled in the SVE/Equipment Enclosure, and treated in the water treatment module consisting of an equalization tank, bag filters, transfer pump, and an activated carbon treatment system.

D. Following groundwater treatment, the groundwater will be re-heated in the boiler module and will be pumped back to the SVE/Equipment Enclosure for distribution to injection wells under the school.

E. HWF system operations will occur during the summer only, when school is not in session.

F. Prior to the start of school, HWF system operations will end and the cooling phase will begin.

G. Following the CWF cooling phase, CWF will continue without active cooling.

H. SVE operation will continue throughout the year, and consist of a 500 standard cubic feet per minute (scfm) extraction blower, air/air heat exchanger, and activated carbon treatment. Condensate from the SVE system will be disposed of in a sanitary sewer connection.

1.03 PERFORMANCE REQUIREMENTS

A. Meet required performance specifications for SVE, boiler, and chiller systems, including 60 gallons per minute (gpm) of 160 degree Fahrenheit water for injection and 500 scfm SVE system.

B. All operating equipment shall meet noise requirements as defined in Addendum #3 to 2010 Compliance Monitoring Plan Update, BNSF Former Maintenance and Fueling Facility, Skykomish, Washington. The following engineering controls shall be constructed into the equipment modules as required to meet the aforementioned standards:

1. Blower and pump sound isolating bases
2. Duct silencers
3. Equipment sound enclosures
4. Sound barriers
5. Locating duct discharges away from School

C. Compliance: The Contractor shall be responsible for compliance with requirements of any and all permits and approvals.

D. The Contractor shall comply with the following general procedures:

1. Activated carbon treatment for SVE offgas.
2. Activated carbon treatment of extracted groundwater, with pre-filtration using bag filters.
3. Diesel-powered boiler with secondary heat exchanger.
4. SVE/Equipment Enclosure with SVE system, programmable logic controller (PLC) control room, and backup generator.
5. Interconnection and communication between modules.
6. Modules shall be fabricated off the site in a UL-approved fabrication shop, and shall be shipped to the site ready for plumbing and electrical connections.
7. SVE/Equipment Enclosure layout shown in sheet PM-101 is suggested, and contractor is encouraged to provide value-engineering on this design based on their experience.
8. For all modules, contractor will provide layout drawings, piping and instrumentation diagrams, electrical layouts, and one-line diagrams.
9. Preferred size of the modules is as follows: SVE/Equipment Enclosure, 8 feet wide by 8 feet high by 40 feet long (standard shipping container). For all other modules, a size of 8 feet wide by 8 feet high by 20 feet long is preferred.

1.04 SUBMITTALS

A. All submittals shall be completed in accordance with Section 01330 - Submittal Procedures.

B. Contractor shall prepare equipment layout drawings, piping and instrumentation diagrams, and electrical one-line diagrams for all modules.

C. Acoustical engineering controls required to meet acoustical performance requirements.

D. Additional submittals shall be in accordance with other specifications herein.

1.05 SEQUENCING AND SCHEDULING

A. Contractor shall conduct installation in accordance with an approved schedule submitted as part of the submittals section.

B. Systems Monitoring Enclosure: As part of the 2015 subsurface equipment installation, the Contractor shall install a Systems Monitoring Enclosure to terminate remote monitoring controls, including sensors for groundwater level monitoring, groundwater temperature monitoring, building subslab pressure differential monitoring, and indoor photo0ionization detector (PID) monitoring.

C. Treatment Equipment Installation: The HWF, CWF, and SVE equipment modules will be installed in the spring of 2016. Following equipment installation, the CWF and SVE systems will be commissioned and made operational prior to the end of the 2015-2016 school year (June 16, 2016). Commissioning and testing that potentially impacts the school environment shall only be performed after 3:00 PM or on weekends or as approved by the School.

D. Equipment testing and certifications will be required on the modules prior to shipment.

E. Contractor shall consent to inspections prior to shipment of modules at the request of the Owner.

PART 2 – PRODUCTS

2.01. MODULAR PRE-WIRED, PRE-PLUMBED, PRE-TESTED COMPONENTS

A. Systems Monitoring Enclosure: A separate enclosure for termination of remote monitoring sensors shall be installed and designed to provide real-time remote monitoring of subsurface conditions and conditions within the school.

B. SVE/Equipment Enclosure: 500 scfm SVE system with activated carbon offgas treatment designed to treat an average of 87 parts per million (ppm) total petroleum hydrocarbons as to discharge requirement of 95% reduction in petroleum hydrocarbons as measured by PID, control room with PLC, human machine interface (HMI), and cell phone uplink to an internet monitoring system.

C. Water treatment module with 60 gpm activated carbon treatment capacity to treat extracted groundwater to remove trace hydrocarbon concentrations. System shall include at a minimum: equilibration tank, transfer pump, bag filters, and activated carbon units. Module shall communicate system status with the SVE/Equipment Enclosure using an enable or fault signal (digital input to control system PLC).

D. Boiler system, #2 oil fired with approximately 4.8 mega British thermal unit (MBTU) to produce 60 gpm of 160 degree Fahrenheit water. Contractor to provide diesel tank, water softener, heat exchanger, and other features according to Section 15518.

E. Chiller system, approximately 75 tons for 60 gpm cooling water from 100 to 70 degrees Fahrenheit. Contractor may propose either a cooling tower or chiller system to meet these performance requirements.

2.02. SYSTEMS CONTROL

A. Control system will consist of a combination of manual and automatic controls, with systems shutdown in the event of off-normal conditions, as detailed in the design and sheet P-110.

B. Systems will be capable of remote monitoring using the internet via a data cell phone uplink installed in the SVE/Equipment Enclosure.

PART 3 – EXECUTION

3.01 GENERAL

A. Contractor shall furnish all labor, materials, and equipment, and perform all operations required to install and test the component modules and related equipment.

B. Contractor shall locate system modules at the location on the site designated by the Engineer, as shown on sheets PC-101 and PC-102. As much as possible, equipment should be located in a permanent location for the entire duration of the project.

3.02 QUALITY CONTROL

A. Contractor shall document start-up testing, including system checks, alarm and interlock function, and acoustical testing, and shall confirm communication between modules.

B. Fabrication of modules, including electrical fixtures and connections, shall be conducted at a UL shop.

C. Inspection of module fabrication facilities may be conducted by Engineer.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 13220

VAPOR PHASE ACTIVATED CARBON ADSORPTION UNITS

PART 1 – GENERAL

1.01 SUMMARY

A. This specification includes requirements for treatment of SVE vapors by vapor phase carbon adsorption.

1.02 PROJECT CONDITIONS

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install vapor phase carbon units for treatment of SVE offgas.

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330:

1. Manufacturer's specifications
2. Technical product data
3. Installation instructions

B. Contractor shall submit any proposed deviations from the Specifications.

1.04 QUALITY ASSURANCE

A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust, and/or other contaminants.

B. References listed below form a part of this specification to the extent referenced:

1. ASTM INTERNATIONAL (ASTM)
    a. ASTM D2652 (2011) Activated Carbon
    b. ASTM D2854 (2009) Apparent Density of Activated Carbon
    c. ASTM D2862 (2010) Particle Size Distribution of Granular Activated Carbon
    d. ASTM D2866 (2011) Total Ash Content of Activated Carbon
    e. ASTM D2867 (2009) Moisture in Activated Carbon
    f. ASTM D3802 (2010) Ball-Pan Hardness of Activated Carbon
    g. ASTM D4607 (1994; R 2011) Determination of Iodine Number of Activated Carbon
    h. ASTM D5228 (1992; R 2010) Determination of the Butane Working Capacity of Activated Carbon

PART 2 – PRODUCTS

2.01. VAPOR PHASE CARBON

A. Vapor Phase Carbon:

Provide a vapor phase activated carbon adsorption system as a complete once-through forced flow system. The system shall be capable of reducing the levels of the listed organic contaminants to the values shown in Treatment Requirements table below. Fill the unit with granular activated carbon for removal of organic contaminants from soil vapor extraction air/gas. Equipment shall include but shall not be limited to vessels containing activated carbon, supporting equipment, and accessories. Terminology is in conformance with ASTM D2652. The system shall be complete with 2 carbon vessels in series. The system shall be designed to operate continuously, 24 hours per day, 7 days per week.

B Design Requirements:

The following requirements shall be met:

1. Minimum equipment design life: 10 years.
2. Vessel type: interchangeable canisters.
3. Adsorption system design requirements:
    a. Maximum vertical projection: 5 feet.
    b. Maximum ground surface coverage: 10 by 10 feet.
4. Ambient air temperature:
    a. Maximum: 100 degrees Fahrenheit.
    b. Minimum: 10 degrees Fahrenheit.
5. Influent Air/Gas Conditions

	Minimum	Average	Maximum	Unit of Measure
Relative Humidity	40	60	80	percent
Total Petroleum Hydrocarbons – Gasoline	10	87	100	parts per million volume (ppmv)

6. Process Conditions

	Minimum	Maximum
Air/gas flow rate	100 cfm	1200 cfm
Air/gas temperature	80 degrees Fahrenheit	110 degrees Fahrenheit
Inlet Pressure	0.5 pounds per square inch gauge (psi)	1 psig

7. Treatment Requirements

	Percent Removal
Petroleum hydrocarbons (measured by PID)	95

C. Carbon Properties:

Material shall conform to the following list; submit certificates attesting that the activated carbon furnished meets the specified requirements. Also, submit the type of activated carbon, with isotherms for the selected carbon, with each of the volatile organic compounds listed in the effluent requirements for the anticipated temperature range at 50 percent relative humidity. Use design calculations or vendor computer models to estimate the mass of carbon required and the breakthrough curves for the listed organic compounds in the carbon bed.

1. The initial charge of carbon shall be virgin carbon. Subsequent charges shall be virgin or regenerated carbon.
2. The carbon adsorption system shall be capable of reducing emissions for individual compounds to below the limits specified in Treatment Requirements table above.
3. Approximate average volatile organic composition of the vapor stream shall be based on estimated influent component levels as specified in Influent Air/Gas Conditions and Process Conditions tables above.
4. Minimum butane working capacity of new activated carbon of 23.8 percent by weight shall be as determined by ASTM D5228.
5. Minimum iodine number of virgin or reactivated carbon of 1000 shall be as determined by ASTM D4607.
6. Maximum moisture content of 2 percent by weight shall be as determined by ASTM D2867.
7. Maximum total ash content of 10 percent by weight shall be as determined by ASTM D2866.
8. Minimum hardness number of 90 necessary for the required life in vapor phase applications shall be as determined by ASTM D3802.
9. Activated carbon particle size shall be uniform for consistent pressure drop characteristics. Maximum particle size shall be 0.2 inch diameter as determined by ASTM D2862.
10. The granular activated carbon shall be of the type that can be accepted for off-site regeneration of the spent activated carbon by an approved carbon regeneration facility.
11. Minimum apparent density of 0.45 grams per cubic centimeter (g/cc) shall be as determined by ASTM D2854.
12. Maximum pressure drop shall be 2 inches of water per foot of bed depth, measured in air at 70 degrees Fahrenheit.
13. US Sieve size shall be 4 by 8.
14. Material shall be free from impurities that affect the serviceability and appearance of the finished product.

2.02 CARBON VESSELS

A. Requirements:

1. Minimum Number of Vessels: 2.
2. Minimum Adsorber Diameter: 46 inches.
3. Material of Construction: carbon steel.
4. Maximum Allowable Working Pressure: 15 psig.
5. Minimum Carbon Quantity per Vessel: 1000 pounds.
6. Minimum Carbon Bed Depth: 72 inches.
7. Flow Direction: upflow.
8. Outlet Collector: removable cover.
9. Inlet Distributor: Integral.
10. Minimum Allowable Temperature: 180 degrees Fahrenheit.
11. Condensate drains will be provided on each unit.
12. Insulation to prevent cooling of the air/gas in the system shall be installed, consisting of blanket insulation with UV foil cover, approximately 0.25 inch thick.

B Connections:

Flexible 8 inch duct hoses shall be used for piping between vessels, in accordance with Section 15200 and Sheets P-108 and PM-101.

PART 3 – EXECUTION

3.01 CARBON VESSEL INSTALLATION

A. Install equipment as shown and in accordance with written instructions of the manufacturer. A gravel pad foundation for each carbon unit shall be designed to support the units.

3.02 QUALITY CONTROL

A. Record data documenting pressure drop field test shall be recorded and documented in a formal field test report.

END OF SECTION

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SECTION 13803

PROCESS CONTROL EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

The process instrumentation and control system shall be used to monitor and control the operation of process equipment as specified and in accordance with the control interlock and input/output schedules shown on the drawings. The control system shall provide for operator interaction, overall control system supervision, and process equipment control and monitoring. The system provided shall include process instruments as well as the Programmable Logic Controller (PLC), Human Machine Interface (HMI), cellphone data uplink to the internet, and all associated hardware and software. If a dependable cellphone data uplink is not available, a landline shall be installed. Modules described in Section 11200 shall communicate with the process control system. Any equipment (e.g., boiler system) with separate process controls shall be integrated to the PLC and HMI, as appropriate to provide a fully integrated control system for the entire remediation system.

1.02 PROJECT CONDITIONS

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish the process control system.

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330.

1. Shop drawings of installation and wiring, and detailed drawings containing details required to demonstrate that the system has been coordinated and will properly function as a unit. Include in the drawings, as appropriate: product specific catalog cuts; a drawing index; a list of symbols; a series of drawings for each control system using abbreviations, symbols, nomenclature and identifiers as shown. Ladder logic diagrams summarizing the control scheme and descriptive text shall also be provided

2. Product data of control hardware, including manufacturer's descriptive and technical literature, performance charts and installation instructions. Product specific catalog cuts shall be in booklet form, indexed to the unique identifiers, and shall consist of data sheets that document compliance with the specification. Where multiple components are shown on a catalog cut, the application specific component shall be marked.

3. Sensor and meter data shall include manufacturer's descriptive and technical literature, catalog cuts, performance charts and installation instructions (where units require field installation).

4. Operations and maintenance manual (2 copies)

1.03 QUALITY ASSURANCE

A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants.

B. After installation of equipment, the engineer or technician shall submit a signed certificate or certified written statement that the equipment is installed in accordance with the manufacturer's recommendations.

C. Complete testing of all aspects of the system control/alarm function shall be completed at the fabricator of the SVE/Equipment Enclosure, with simulation from other modules (water treatment, boiler, and chiller) as appropriate.

D. References listed below form a part of this specification to the extent referenced

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 61131-3 (2003) Programmable Controllers - Part 3: Programming Languages

INTERNATIONAL TELECOMMUNICATION UNION (ITU)

ITU V.34 (1998) Data Communication Over the Telephone Network: A Modem Operating at Data Signaling Rates of up to 33,600 bits for use on the General Switched Telephone Network and on Leased Point-to-Point Two-Wire Telephone Type Circuits

ITU V.42 bis (1990) Data Communication over the Telephone Network: Data Compression Procedures for Data Circuit Terminating Equipment (DCE) Using Error Correction Procedures

ISA - INTERNATIONAL SOCIETY OF AUTOMATION (ISA)

ISA 7.0.01 (1996) Quality Standard for Instrument Air

ISA MC96.1 (1982) Temperature Measurement Thermocouples

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA C12.1 (2008) Electric Meters; Code for Electricity Metering

NEMA ICS 1 (2000; R 2005; R 2008) Standard for Industrial Control and Systems General Requirements

NEMA ICS 2 (2000; Errata 2002; R 2005; Errata 2006) Standard for Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated Not More than 2000 Volts AC or 750 Volts DC: Part 8 - Disconnect Devices for Use in Industrial Control Equipment

NEMA ICS 3 (2005) Standard for Industrial Control and Systems: Medium Voltage Controllers Rated 2001 to 7200 Volts AC

NEMA ICS 4 (2005) Industrial Control and Systems: Terminal Blocks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2008; AMD 1 2008) National Electrical Code - 2008 Edition

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST SP 250 (1991) Calibration Services Users Guide

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-232-F (1997; R 2002) Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15 Radio Frequency Devices

47 CFR 68 Connection of Terminal Equipment to the Telephone Network

UNDERWRITERS LABORATORIES (UL)

UL 1059 (2001; Rev thru Dec 2006) Terminal Blocks

UL 508 (1999; Rev thru Sep 2008) Standard for Industrial Control Equipment

UL 94 (1996; Rev thru Jun 2009) Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

PART 2 – PRODUCTS

2.01. MATERIALS AND EQUIPMENT

A. Standard Products

Materials and equipment shall be standard unmodified products of a manufacturer regularly engaged in the manufacturing of such products. Units of the same type of equipment shall be products of a single manufacturer. Items of the same type and purpose shall be identical and supplied by the same manufacturer, unless replaced by a new version.

B. Nameplates

Each major component of equipment shall have the manufacturer's name and address, and the model and serial number in a conspicuous place. Laminated plastic nameplates shall be provided for equipment devices and panels furnished. Each nameplate shall identify the device, such as pump "P-1" or valve "VLV-402". Labels shall be coordinated with the schedules and the process and instrumentation drawings. Laminated plastic shall be 1/8 inch thick, white with black center core. Nameplates shall be a minimum of 1 by 3 inches with minimum 1/4 inch high engraved block lettering. Nameplates for devices smaller than 1 by 3 inches shall be attached by a nonferrous metal chain. All other nameplates shall be attached to the device.

2.02 GENERAL REQUIREMENTS

Equipment located outdoors, not provided with climate-controlled enclosure, shall be capable of operating in the conditions identified in the drawings.

2.03 MONITORING AND CONTROL PARAMETERS

The control system shall be complete including sensors, field preamplifiers, signal conditioners, offset and span adjustments, amplifiers, transducers, transmitters, control devices, engineering units conversions and algorithms for the applications; and shall maintain the specified end-to-end process control loop accuracy from sensor to display and final control element. Control equipment shall be powered by a 120 VAC, single phase, 60 Hz power source, with local transformers included as needed for signal transmission and subsystem operation. Connecting conductors shall be suitable for installed service. Enclosures shall be rated for NEMA 4.

Sensors within the school building (differential pressure and groundwater level/temperature shall be battery powered, and WIFI capable through either an integral WIFI capability or connection to a WIFI node/transmitter. A gateway/router shall be installed for communication with WIFI LAN sensor/transmitters. The gateway will require 120 VAC power, with a UPS backup. The gateway will be centrally located to ensure proper signal strength. If necessary repeaters shall be installed. The gateway will be connected to the treatment system enclosure using an Ethernet cable.

Approved product: Node/sensor interface and router/gateway – National Instruments

A. Transmitter

Unless indicated otherwise, each sensor shall be provided with a transmitter, selected to match the sensor. Except where specifically indicated otherwise on the drawings, the transmitter shall be provided with a visual display of the measured parameter and shall provide a 4 to 20 mA dc output or converted MODBUS signal proportional to the level of the measured parameter. Transmitter shall be located where indicated, mounted integrally with the sensor, pipe mounted, wall mounted or installed in the control panel. The distance between the sensor and transmitter shall not exceed the manufacturer's recommendation. Field preamplifiers and signal conditioners shall be included when necessary to maintain the accuracy from sensor to the programmable logic controller or recorder.

2.04 PROGRAMMABLE LOGIC CONTROLLER (PLC)

A. General

PLCs shall be micro-processor based, capable of receiving discrete and analog inputs and, through programming, shall be able to control discrete and analog output functions, perform data handling operations and communicate with external devices. PLCs shall meet the requirements of Class A computing devices, and shall be labeled as set forth in 47 CFR 15 and shall be able to withstand conducted susceptibility test as outlined in NEMA ICS 1, NEMA ICS 2, NEMA ICS 3, or IEEE C37.90.1. PLCs shall function properly at temperatures between 32 and 122 degrees F at 5 to 95 percent relative humidity non-condensing and shall tolerate storage temperatures between minus 40 and plus 140 degrees F at 5 to 95 percent relative humidity non-condensing.

One or more power supply modules shall be provided as necessary to power other modules installed in the same cabinet. Power supply modules shall plug directly into the

backplane. Auxiliary power supplies may be used to supply power to remote cabinets or modules.

Approved products: Allen-Bradley

B. Loop PLC

PLCs shall be single or multiple loop controllers depending on the control system requirements. The controller shall have a scalable process variable for each loop. Analog input signals or converted analog to digital shall be based on the use of proportional, integral and derivative (PID) control logic. Analog outputs shall be configured as direct acting or reverse acting. The controller shall have keyboard, display, auto/manual selection for control of each loop output, remote setpoint, adjustment/local setpoint adjustment selection with adjustable high-end and low-end limits, ratio and bias adjustment on remote setpoint input, operator-initiated self-tune/manual-tune selection and anti-reset wind-up feature. Controller shall power analog output loops to 20 mA dc when connected to a load of 600 ohms.

1. Central Processing Unit (CPU)

   The central processing unit shall be microprocessor based and shall provide time of day, scanning, application program (ladder rung logic) execution, storage of application programs, storage of numerical values related to the applications process and logic, I/O bus traffic control, peripheral and external device communications and self diagnostics.

2. Power Requirements

   Each controller shall be powered by 120 vAc. Power consumption shall not exceed 25 watts. Controller shall provide electrical noise isolation between the AC power line and the process variable inputs, remote setpoint inputs and output signals of not less than 100 dB at 60 Hertz common mode rejection ration and not less than 60 dB at 60 hertz normal-mode rejection ration.

3. On-Off Switch

   Each controller shall be provided with an integral on-off switch. If the controller is not provided with a manufacturers standard on-off switch, a miniature toggle type switch shall be installed near the controller and shall be clearly labeled as to its function.

4. Parameter Input and Display

   Control parameters shall be entered and displayed directly, in the correct engineering units, through a series of keystrokes on a front panel display with decimal point and polarity indication. Alternately, control parameters access and adjustment shall be made through the workstation.

5. Manual Tuning

   Controllers shall be provided with manual tuning operation which shall apply to proportional, integral and derivative modes of control, by means of individually adjustable mode constants. These adjustments shall be set for the appropriate

value if a particular control mode action is required or to zero if that particular mode is not desired. The proportional mode constant shall be adjustable from 0 to 200 percent of the input signal range. The integral mode constant shall be adjustable from 0 to 20 repeats per minute. The derivative mode constant shall be adjustable from 0 to 5 minutes.

C. Input/Output Characteristics

Each controller shall allow for analog input, analog output, discrete input and discrete output. The number and type of inputs and outputs for the system shall be as shown on the submittals/drawings and shall comply with the sequence of control. The system capacity shall include a minimum of 20 percent spare input and output points (no less than two points) for each point type provided. During normal operation, a malfunction in any input/output channel shall affect the operation of that channel only and shall not affect the operation of the CPU or any other channel.

D. Operating Control Table

The following table describes the general operating control strategy for the system

Operational Control Table

Pump/Blower	Sheet	Description	Control Mode	Comments
P-101 - P-110	P-104	Groundwater extraction pumps, ¾ hp, 240 VAC, VFD	Control panel hand-off-auto (HOA) switch for each pump. Manual mode includes manual rheostat speed control for each pump. Auto consists of water level set point for each or all pumps. General shutdown with system fault (water treatment fault, school injection well vault flood, SVE system fault). Start sequence includes water treatment system ready, SVE ready, and boiler/chiller ready (if in boiler/chiller mode).	Main PLC manual/auto selectable option. Groundwater level set point on GWM-1 or GWM-2, with set point tolerance, control algorithm, ramp limit, speed limit and flow rate limit.
S-101 – S-110	P-104	Skimmers, 240 VAC	Local, with individual skimmer tank full warning to Main PLC.	High-high oil level switch integral to unit.
P-201	P-106	Water treatment system transfer pump, 480 VAC, VFD	Water treatment PLC level control equalization tank set point. Shutdown if equalization tank high-high alarm, discharge	Controlled at water treatment PLC, alarms rollup to Main PLC.

			backpressure alarm, valve closed, high injection back pressure, or other P-101 0 P-110 faults above. If in boiler mode, delay stop for boiler shutdown/cool down. Start sequence includes SVE blower ready, valve position switch open.	
B-301	P-108	SVE blower, 480 VAC, VFD	Main PLC speed control. Shutdown for moisture separator high-high, high backpressure	VFD speed adjustable at Main PLC.
P-306	P-108	Moisture separator water pump	Local moisture separator level switch (high/low) and Main PLC	
P-301 – P-305	P-107	SVE manifold condensate sump pumps, 120 VAC	Timer based pump out of condensate sumps	Main PLC adjustable timer

Note: Main PLC is located in SVE Enclosure Control Room, Water treatment PLC is located in the water treatment enclosure.

2.05 PLC SOFTWARE

All PLC software described in this specification shall be furnished as part of the complete control system.

A. Operating System

Each PLC shall be provided with the manufacturer's standard operating system software package. The PLC shall maintain a point database in its memory that includes all parameters, constraints and the latest value or status of all points connected to the PLC. Execution of the PLC application programs shall use the data in memory resident files. The operating system shall support a full compliment of process control functions. It shall be possible to define these functions using a mix of function blocks, ladder logic diagrams, sequential function charts and text programming. Programming methods and interactions shall be based on IEC 61131-3. A combination of the programming methods shall be possible within a single controller. The operating system shall allow loading of software locally or from the central station and data files from the portable tester. It shall also support data entry and diagnostics using an operator interface panel attached directly to the PLC. Each PLC shall be capable of operating in stand alone mode.

1. Startup

   The PLC shall have startup software that causes automatic commencement of operation without human intervention, including startup of all connected I/O functions. A PLC restart program based on detection of power failure at the PLC shall be included in the PLC software. The restart program shall include start time delays between successive commands to prevent demand surges or overload trips.

2. Failure Mode

   Upon failure for any reason, each PLC shall perform an orderly shutdown and force all PLC outputs to a predetermined state, consistent with the failure modes shown and the associated control device.

B. Functions

The controller operating system shall be able to scan inputs, control outputs, and read and write to its internal memory in order to perform the required control as indicated in the sequence of control on the drawings. The controller shall periodically perform self diagnostics to verify that it is functioning properly.

1. Analog Monitoring

   The system shall measure and transmit all analog values including calculated analog points.

2. Logic (Virtual)

   Logic (virtual) points shall be software points entered in the point database which are not directly associated with a physical I/O function. Logic (virtual) points shall be analog or digital points created by calculation from any combination of digital and analog points, or other data having all the properties of real points, including alarms, without the associated hardware. Logic (virtual) points shall be defined or calculated and entered into the database. The calculated analog point shall have point identification in the same format as any other analog point.

3. State Variables

   If an analog point represents more than two (up to 8) specific states, each state shall be nameable. For example, a level sensor shall be displayed at its measured engineering units plus a state variable with named states usable in programs or for display such as low alarm/low/normal/high/high alarm.

4. Analog Totalization

   Any analog point shall be operator assignable to the totalization program. Up to eight analog values shall be totalized within a selectable time period.

5. Trending

   Any analog or calculated point shall be operator assignable to the trend program. The sample intervals shall be able to be defined, modified, or deleted online.

C. Alarm Processing

Each PLC shall have alarm processing software for AI, DI, and PA alarms for all real and virtual points connected to that PLC.

1. Digital Alarms

Digital alarms are those abnormal conditions indicated by DIs as specified and shown. The system shall automatically suppress analog alarm reporting associated with a digital point when that point is turned off.

2. Analog Alarms

Analog alarms are those conditions higher or lower than a defined value, as measured by an AI. Analog readings shall be compared to predefined high and low limits, and alarmed each time a value enters or returns from a limit condition. Unique high and low limits shall be assigned to each analog point in the system. In control point adjustment (CPA) applications, key the limit to a finite deviation traveling with the setpoint. The system shall automatically suppress analog alarm reporting associated with an analog point when that analog point is turned off.

3. Pulse Accumulator (PA) Alarms

Pulse accumulator alarms are those conditions calculated from totalized values of accumulator inputs or PA input rates that are outside defined limits as specified and shown. PA totalized values shall be compared to predefined limits and alarmed each time a value enters a limit condition. Unique limits shall be assigned to each PA point in the system.

D. Failure Mode

In the event of a PLC failure, the controlled equipment shall continue to function in an appropriate failure mode.

2.06 CONTROL PANELS

A. Components

1. Enclosures

The enclosure for each control panel shall conform to the requirements of NEMA 250 for the types specified. Finish color shall be the manufacturer's standard, unless otherwise indicated. Damaged surfaces shall be repaired and refinished using original type finish. Enclosures for equipment installed outside of the controls trailer shall be NEMA Type 4.

2. Controllers

Controllers shall be in accordance with paragraph Programmable Logic Controller (PLC).

C. Panel Assembly

Control panels shall be factory assembled and shipped to the jobsite as a single unit. Panels shall be fabricated as indicated and devices shall be mounted as shown or required. Each panel shall be fabricated as a bottom-entry connection point for control system electrical power and control system wiring.

D. Grounding

Control panel enclosures shall be equipped with a solid copper ground bus or equivalent. The ground bus shall be securely anchored to the enclosure so as to effectively ground the entire structure. Clamp-type terminals sized large enough to carry the maximum expected current shall be provided on the ground bus for grounding cables. Where a definite circuit ground is required, a single wire not less than #10 AWG shall run independently to the panel ground bus and shall be fastened to the ground bus with a bolted terminal lug. Cases of instruments, relays and other devices shall be effectively grounded through the enclosures steel structure unless otherwise indicated. Insulated wiring having a continuous rated current of not less than the circuit fuse rating shall be used for grounding. Grounding terminals of power receptacles shall be solidly grounded to the panel enclosure.

E. Convenience Outlet

A 120 volt ac, 20 amp, ground fault interruption (GFI) type duplex convenience outlet shall be provided inside the panel. The outlet circuit shall be separate from the panel power circuit.

2.07 CENTRAL WORKSTATION EQUIPMENT

A. Workstation Computer

Computer can be of several potential configurations, subject to approval of the Engineer. Computing devices, as defined in 47 CFR 15, supplied as part of the control system shall be certified to comply with the requirements of Class B computing devices and shall be labeled as set forth in 47 CFR 15. A small desk with a chair will also be provided by contractor for the workstation. Windows 7 operating system required.

B. Uninterruptible Power Supply (UPS)

Self-contained UPSs suitable for installation and operation shall be provided at the central workstation and any ‘gateways’ required as components of the instruments’ wireless network system. The units shall be sized to provide a minimum of 2 hours of operation. The UPSs shall incorporate surge suppression, noise filtering (normal and common mode) short circuit protection and voltage regulation (brownout and

overvoltage protection). UPSs shall be complete with all necessary power supplies, transformers, batteries, and accessories and shall include visual indication of normal power operation, UPSs operation, abnormal operation and visual and audible indication of low battery power. The UPSs shall comply with the Federal Communications Commission Standard 15J part A for radio noise emissions.

2.08 SOFTWARE

The software shall provide the communication, programming and control capabilities necessary to support all specified points and functions, plus a minimum expansion of 50 percent of the current number of points, complete with their point database. The software shall be one or more standard software modules. Where multiple modules are used the modules shall be capable of sharing data and operating together seamlessly. Software shall be windowing type using icons and pull down menus. The system shall support multiple user operation with multiple tasks for each user and shall support operation and management of all peripheral devices.

A. Graphical Operations

1. Graphical User Interface/Human Machine Interface

The system shall be provided with an object-oriented, mouse driven or touch-screen driven, graphical user interface or human machine interface (HMI). The HMI shall consist of a graphical representation of the soil vapor extraction (SVE) and groundwater extraction (GWE) process flow diagrams, with real-time data output labels. A cell phone data secure web-based uplink shall be provided with HMI/PLC to enable remote monitoring and process adjustment.

Approved Products: Rockwell Automation FactoryTalk

B. Display Information

The central workstation shall display information necessary to support all requirements specified, including: operator commands; alarm notification; reports; system graphics as specified and as shown, incorporating dynamic data; and curve plotting.

C. Alarms

The software shall notify an operator of the occurrence of an alarm condition. The control system alarm history shall be stored in an ASCII file and shall be recallable by the operator using the report generator. Alarm messages shall take precedence over other functions. Operator acknowledgment of one alarm shall not be considered as acknowledgment of any other alarm nor shall it inhibit reporting of subsequent alarms. Alarm data to be displayed and stored shall include: identification of the alarm; date and time to the nearest second of occurrence; device or sensor type; limit exceeded (if analog); engineering units; current value or status; alarm class; and alarm messages.

1. Digital Alarms

Digital alarms shall be subject to immediate reporting, within the alarm response time, at the central station.

2. Analog Alarms

These alarms shall be subject to immediate reporting, within the alarm response time, at the central workstation. The control panel analog readings shall be compared to predefined high and low limits, and alarmed to the central station each time a value enters or returns from a limit condition. The program shall automatically change the high or low limits, or both, of any analog point, based on time scheduled operations as specified, allowing for a time interval before the new alarm limit becomes effective. For those applications where setpoint adjustments are made, the alarm limit shall be keyed to a finite deviation traveling with the setpoint.

3. Alarm Messages

A unique message with a field of 60 characters shall be provided for each alarm. Assignment of messages to a point shall be an operator editable function. Secondary messages shall be assignable by the operator for printing to provide further information, such as telephone lists or maintenance functions, and shall be editable by the operator.

4. Alarm Classes

Classes of alarms, which will be identified for each item, include class 1 and class 2 alarm conditions. Class 1 (Critical) shall include display, print, and audible alarm at occurrence and at return-to-normal. Acknowledgment of class 1 alarms by the operator shall be required at occurrence and at return-to-normal. Class 2 (Informational) shall include display, print, and audible alarm at occurrence and at return-to-normal. No acknowledgment of class 2 alarms is required unless otherwise shown.

D. Report Generator

Software shall be provided to generate and format standard and custom reports for displaying, printing, and storing on disk. Reports shall use database values and parameters, values calculated using the real time static database or historical data base; with the reports subsequently stored on hard disk. Dynamic operation of the system shall not be interrupted to generate a report. The report shall contain the time and date when the sample was taken, and the time and date when the report was printed.

E. Web-Based Monitoring and Data Interchange

The HMI/PLC shall be capable of real-time uplink to the world wide web to enable real-time monitoring and system adjustment. A cell phone modem and related equipment necessary to effect these capabilities are required.

Software shall be provided to format and store on a zip drive the data, trends, profiles, reports and logs as specified in a defined, standard format such as ASCII text or DIF for export and further processing by other software and/or computer systems. System shall be capable of external database connection (ODBC connection- open database connecdtivity)

F. Control Panel and DTS Circuit Alarms

The system shall supervise each control panel, I/O function and DTS circuit for alarm reporting, including: control panel not responding; control panel responding (return to normal); control panel to central station DTS circuit high error rate; control panel to

control panel DTS circuit high error rate; control panel/central station real time clock error more than 15 seconds (adjustable); control panel intrusion alarm; control panel offline; control panel online (return to normal); control panel failure (self-diagnostics); point not responding to command; and point change of state without command.

G. Central Station Database

The central station database shall be stored on disk and in memory. The static database shall be downloadable as required to control panels in the system, including remote internet access.

H. Historical Data Storage and Retrieval

A historical data storage and retrieval function shall be provided at the central station to collect and store dynamic data. This function shall be in addition to other data storage requirements. The function shall have the capability to collect and store alarm status changes, point values, events and operator commands, and system responses. The storage function shall also have the capability to collect and store multiple sets of analog data at pre-specified sampling rates. This function shall have the capability to retain historical data on hard disk for pre-specified time periods, up to forty five days using last day roll over, for short-term analysis, and then output the data to the zip drive for long-term retention. The operator shall also be able to selectively recall short-term data stored on hard disk. Retrieval and printing of the contents of any selected historical data file shall be available using the data retrieval and report generation program. The output of the report generation program shall be capable of being viewed on the screen, printed in a report, or stored.

I. Trending

Any analog or calculated point shall be operator assignable to the trend program. Points shall be sampled at individually assigned intervals, selectable between one minute and 24 hours. The system shall automatically store the accumulated trend data to an ASCII disk file. The size of the trend data file shall be limited only by available disk space. The program shall print portions of the file as selected by the operator.

J. Analog Monitoring

The system shall measure, transmit, and display analog values, including calculated analog points. Differential measurements shall be displayed as positive or negative values with respect to their reference points shown. An analog change in value is defined as a change exceeding a preset differential value as specified. Each analog change in value shall be operator selectable and settable to provide for a minimum reporting change in value of one-half the specified end-to-end accuracy of the measured variable. Displays and reports shall express analog values in proper engineering units with sign. Each engineering conversion unit shall include range, span, and conversion equation.

1. Analog Totalization

Any analog or calculated point shall be operator assignable to the totalization program. The analog totalization time period shall be defined uniquely for each point. At the end of the period, totals shall be stored on disk for future reference. Totalization shall then restart from zero for the next time period. The program shall keep track of the peak and total value measured during the current period and for the previous period. The operator shall be able to initiate a summary of

totalization information on a point, unit, sub-system or system. The operator shall be able to set or reset each totalized value individually. The operator shall be able to define, modify, or delete the time period online.

PART 3 – EXECUTION

3.01 EQUIPMENT INSTALLATION REQUIREMENTS

A. Installation

Install system components and appurtenances in accordance with the manufacturer's instructions and shall provide necessary interconnections, services, and adjustments required for a complete and operable system. Instrumentation and communication equipment and cable grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation. Adjust or replace devices not conforming to the required accuracies. Factory sealed devices shall be replaced (rather than adjusted). Wiring in exposed areas, including low voltage wiring, shall be installed in metallic raceways or EMT (electrical metallic tubing) conduit.

3.02 SOFTWARE INSTALLATION

Load software required for an operational control system, including databases (for points specified and shown), operational parameters, and system, command, and application programs. Adjust, tune, debug, and commission all software and parameters for controlled systems to assure proper operation in accordance with the sequences of operation and database tables.

3.03 CONTROL DRAWINGS

Control drawings shall be provided for equipment furnished and for interfaces to equipment at each respective equipment location. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation and procedures for safely starting and stopping the system manually shall be prepared and posted beside the diagrams. Diagrams and instructions shall be submitted prior to posting.

3.04 FIELD TESTING AND ADJUSTING EQUIPMENT

Provide personnel, equipment, instrumentation, and supplies necessary to perform site testing. The test procedures shall cover actual equipment and functions specified for the project.

A. Testing, Adjusting and Commissioning

Once the installation has been completed, test, adjust, and commission each control loop and system and verify proper operation of each item in the sequences of operation, including hardware and software. Calibrate field equipment, including control devices, adjust control parameters and logic (virtual) points including control loop setpoints, gain constants, constraints, and verify data communications before the system is placed online. See Section 01810 – Commissioning.

B. Functional Performance Testing (FPT)

Prepare test procedures for the FPT. See Section 01810 – Commissioning.

3.05 FIELD TRAINING

Field training oriented to the specific system shall be provided for designated personnel. A copy of the training manual shall be delivered to prior to the training.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 13900

OIL SKIMMERS

PART 1 – GENERAL

1.01 SUMMARY

A. This specification covers the minimum requirements to which the oil skimmers are designed, fabricated, and tested. The well oil skimmers shall skim oil from the groundwater extraction recovery sumps and be placed in extraction well vaults. Relevant sheets for oil skimmers are PC-103 and PC-104.

1.02 PROJECT CONDITIONS

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install all process piping, valves, and appurtenances, complete and operational.

B. Contractor shall review installation procedures under this and other sections, and coordinate installation of items that must be installed with or before process piping work.

C. Contractor is to provide piping materials and appurtenances as specified and suitable for the service intended. Piping materials, appurtenances, and equipment supplied as part of this contract shall be of equal material and ratings as the connecting pipe, new and unused, except for testing equipment. Components that serve the same function and are the same size shall be identical products of the same manufacturer. Pipe fittings shall be compatible with the applicable pipe materials.

D. The drawings indicate the general location and arrangement of the piping systems. So far as practical, install piping as indicated. Installed piping shall be free of sags or bends. Exposed piping shall be installed at right angles and parallel to building walls. Locate groups of pipes parallel to each other, spaced to permit servicing of valves and with at least 1 inch of clearance around insulated pipes.

E. For slab, floor, wall, and roof penetrations, keep on site pertinent wall pipes and sleeves before they are required for placement in concrete forms. Verify and coordinate the size and location of building and structure pipe penetrations before forming and placing concrete.

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330:

1. Manufacturer’s specifications
    a. Shop drawings
2. Technical product data
    a. Materials and Equipment
    b. Operating Instructions
    c. Belt Material Sample

3. Installation instructions

4. Operation and Maintenance Manuals

5. Any other data necessary to demonstrate that pipe and accessories comply with specifications.

B. The Contractor shall prepare and submit an installation schedule of all oil skimmers to facilitate the Engineer's inspections.

C. Contractor shall submit any proposed deviations from the Specifications.

1.04 QUALITY ASSURANCE

A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust, and/or other contaminants. Proper protection and care of material before, during, and after installation is the Contractor's responsibility. Any material found to be damaged shall be replaced at the Contractor's expense. During installation, piping shall be capped to keep out dirt and other foreign matter. A material safety data sheet in conformance with 29 CFR 1910 Section 1200(g) shall accompany each chemical delivered for use in pipe installation. At a minimum, this includes all solvents, solvent cements, glues, and other materials that may contain hazardous compounds. Handling shall be in accordance with ASTM F 402. Storage facilities shall be classified and marked in accordance with National Fire Protection Association (NFPA) 704. Materials shall be stored with protection from puncture, dirt, grease, moisture, mechanical abrasions, excessive heat, ultraviolet radiation damage, or other damage. Oil skimmers shall be handled and stored in accordance with the manufacturer's recommendation.

B. All oil skimmers and related components must be new and unused.

C. References listed below form a part of this specification to the extent referenced.

National Electrical Manufacturers Association (NEMA)

NEMA MG 1 (2011; Errata 2012) Motors and Generators

National Fire Protection Association

NFPA 30 (2012; Errata 2011) Flammable and Combustible Liquids Code

NFPA 70 (2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code (NEC)

NFPA 704 (2012) Standard System for the Identification of the Hazards of Materials for Emergency Response

American Welding Society (AWS)

AWS D1.1/D1.1M (2008; Errata 2009) Structural Welding Code - Steel

ASME International (ASME)

ASME B1.1 (2003; R 2008) Unified Inch Screw Threads (UN and UNR Thread Form)

ASME B1.20.1 (1983; R 2006) Pipe Threads, General Purpose (Inch)

ASME B16.11 (2005) Forged Fittings, Socket-Welding and Threaded

ASTM International (ASTM)

ASTM A 105/A 105M (2005) Standard Specification for Carbon Steel Forgings for Piping Applications

ASTM A 108 (2007) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished

ASTM A 181/A 181M (2006) Standard Specification for Carbon Steel Forgings, for General-Purpose Piping

ASTM A 193/A 193M (2008b) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

ASTM A 194/A 194M (2009) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both

ASTM A 36/A 36M (2008) Standard Specification for Carbon Structural Steel

ASTM A 576 (1990b; R 2006) Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality

ASTM A 587 (1996; R 2005) Standard Specification for Electric-Resistance-Welded Low-Carbon Steel Pipe for the Chemical Industry

ASTM F 402 (2005) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

International Organization for Standardization (ISO)

ISO 228-1 (2000) Pipe Threads Where Pressure-Tight Joints Are Not Made on The Threads - Part 1: Dimensions, Tolerances and Designation

PART 2 – PRODUCTS

2.01. OIL SKIMMER

A. Oil Skimmer

The skimmer shall be capable of skimming and collecting the oil that accumulates in the groundwater extraction recovery sump.

1. Approved Products

   Abanaki PetroXtractor Model PX-B

2. Construction

   Solid welded carbon steel with baked-on powder coat finish. Color RAL5005 (Dark Blue) or equivalent.

3. Pulley Types

   a. Drive Pulley

      Head pulley with nitrile lagging. Additional traction wheel with viton band.

b. Tail Pulley

Polyvinyl chloride housing and pulley; cage-type housing with weight per application.

4. Motor

1/20 Horsepower H.P. 115 Volt, 60Hz. @30 RPM 1.4 Amp shaded pole gear motor, TEFC U.L. and C.S.A. approved.

5. Nameplates

Each piece of equipment shall have a standard nameplate securely affixed in a conspicuous place showing the manufacturer's name, address, type or style, model, serial number, and catalog number. In addition, the nameplate for each skimming unit shall show the capacity in gallons per minute at rated speed in revolutions per minute (RPM). Nameplate for each electrical motor shall show at least the minimum information required by paragraph 10.38 of NEMA MG 1. Any other information that the manufacturer may consider necessary to complete identification shall be shown on the nameplate.

6. Guard

Standard steel drive pulley area cover, bolt in place.

7. Belt Material and Length

2-inch-wide belt capable of skimming per application. Length as specified by manufacturer per application.

8. Wiper Blades

Adjustable wiper, screw-type for tensioning, with single wiper insert.

9. Oil Discharge Outlet

Dual troughs discharging into a single 1-1/4” NPT coupling.

10. Standard Mounting Arrangement

Below-grade mounting in vault/manway.

2.02. OIL SKIMMER CONTROLS

A. Enclosures

All enclosures shall be NEMA 6 or NEMA 4 if fixtures can be removed for winter.

B. Control Panel

High-high panel light, 24 VDC NO/NC relay and 230/120 VAC transformer.

C. Flow Meter

24 VDC flow meter with power and pulse output.

D. Contractor shall provide adequate system controls to permit unattended operation with occasional operator checks for monitoring and adjustments.

E. The Contractor shall provide a notification system to alert an operator if system experiences conditions that will potentially cause the treatment system to shutdown.

F. Contractor shall provide high-level alarms on tanks to prevent overflow conditions. Alarms may cause automatic actions to relieve the condition or may warn the operator.

G. Contractor shall design the control system to accomplish the functions designated. The control system is subject to review and approval by the Engineer.

H. If an upset condition occurs that may result in a release or nonconformance with the discharge permit, Contractor shall immediately suspend operation and notify the Engineer.

2.03. DISPOSAL OF OTHER RESIDUALS

A. Contractor shall manage oil and sediments/sludges produced by the oil skimmer for disposal in accordance with all transportation laws and regulations and the receiving landfill requirements.

PART 3 – EXECUTION

3.01. INSTALLATION

A. Contractor shall install equipment as indicated and specified and in accordance with manufacturer's recommendations.

B. Submit installation drawings for oil skimmers in accordance with referenced standards in this section.

C. Install the controls in a unit-mounted control panel. Provide remote-mounted controllers where indicated.

D. Contractor shall locate equipment at the location on the site designated by the Engineer. To the extent possible, equipment should be located in a permanent location for the entire duration of the project.

E. Contractor shall provide adequate freeze protection required for all water-treatment equipment.

F. Damage to oil skimmers caused by operations, weather, or negligence shall be repaired immediately.

3.02. FIELD QUALITY CONTROL

A. Test belt material for product suitability prior to belt installation.

3.03. OPERATING AND MAINTENANCE INSTRUCTIONS

A. Submit four complete copies of operating instructions outlining the step-by-step procedures required for system start-up, operation, and shutdown. Include in the operating instructions the following for system components: manufacturer's name; model number; service manual; parts list; and brief description of each piece of equipment and its basic operating features; flow diagrams; system layout showing

piping, valves, and controls; approved wiring and control diagrams; control sequence describing start-up, operation, and shutdown; and manufacturer's bulletins, cuts, and descriptive data.

3.04. MAINTENANCE INSTRUCTIONS

A. Submit four complete copies of maintenance instructions for each piece of equipment, including the following: manufacturer's complete list of parts, recommended spare parts and supplies, and current unit prices and source of supply; routine maintenance procedures, including Water Environmental Federation Manual of Practice (WEF MOP) 11 requirements as a minimum; possible breakdowns and repairs; and a troubleshooting guide to help the operator determine what steps must be taken to correct any equipment problems.

END OF SECTION

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SECTION 15182

FLOW MEASURING INSTRUMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. This specification includes requirements for flow measurement of the extracted soil vapors, extracted groundwater, and injected groundwater.

1.02 PROJECT CONDITIONS

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install all flow measurement instruments and related transmitters.

B. Contractor shall review installation procedures under this and other sections, and coordinate installation of items that must be installed with or before installation of flow measurement instruments.

C. Contractor to provide instruments and appurtenances as specified and suitable for the service intended.

D. The drawings indicate the general location and arrangement of the flow meters. So far as practical, install meters as indicated, with appropriate straight piping based on manufacturer's recommendations.

E. Water flow meters will be subject to elevated temperatures of up to 160 degrees Fahrenheit (°F).

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330:

1. Manufacturer's specifications
2. Technical product data
3. Installation instructions
4. Any other data necessary to demonstrate that pipe and accessories comply with specifications.

B. The Contractor shall prepare and submit an installation schedule of flow meters to facilitate the Engineer's inspections.

C. Contractor shall submit any proposed deviations from the Specifications.

1.04 QUALITY ASSURANCE

A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust, and/or other contaminants.

B. References listed below form a part of this specification to the extent referenced

American Water Works Association (AWWA)

AWWA C704 (2012) Propeller-Type Meters for Waterworks Applications

ASME International (ASME)

ASME PTC 19.5 (2004; R 2013) Flow Measurement

PART 2 – PRODUCTS

2.01. FLOW METERS

A. Water Propeller Meter

Provide a propeller meter where indicated. The meter shall measure the velocity and convert it to flow units. The meter shall have a range of 0 to 10 gallons per minute (gpm) for use in a 1-inch carbon steel pipe. Reducing to ½ inch may be required. Service temperature is up to 160 °F. Due to service temperature, computer/display may require mounting away from hot water pipe, depending on the specifications for the unit. These units are required for the injection well vaults.

Approved products: GPI G2S05N09GMA, with detached computer

B. Water Electromagnetic Meters

The magnetic flow meter shall measure the flow of 0 to 100 gpm and be suitable for a 1-inch pipe (extraction well vaults), 1.5-inch pipes (injection well header), and 3-inch hot water and bypass lines, as required in the drawings.

The extraction well header (SVE enclosure) meter (3-inch) shall be compatible with a maximum water temperature of 130°F. Injection header flow meters (1.5 inch) must be compatible with 160 F water.

The magnetic flow meter system shall include a flow tube, local read-out receiver, remote transmission, and interconnecting cable where indicated. The flow meter shall be a tetrafluoroethylene-lined stainless steel or tetrafluoroethylene-lined aluminum or fiberglass tube with the necessary cores and coils to provide a magnetic field without any interference and with threaded connections. Electrodes shall be of stainless steel. The tube shall operate from 30 VDC maximum power. A weatherproof housing shall cover the magnets, coils, and connections. There shall be an adjustment for zero and span. Provide DC impulse-type transmission of flow rate.

1. Approved Products

   Seametrics mag meter (extraction well vault)

   Rosemount or Onicon F3100

C. Averaging Pitot Tube for SVE Header

An averaging pitot tube shall measure flow rates of 0 to 100 standard cubic feet per minute (scfm), 120°F maximum temperature. Pipe size is 3-inch polyvinyl chloride pipe, schedule 40. Unit will have a local readout and transmitter.

1. Approved Products

   Rosemount Annubar

PART 3 – EXECUTION

3.01 FLOW METER INSTALLATION

A. Contractor shall furnish the services of an Engineer representative of the manufacturer of the flow measuring equipment for checking the installation, making the necessary adjustments and calibrations, placing the equipment in operation, and performing the acceptance tests. Install all flow measuring equipment in accordance with the recommendations of the manufacturer.

3.02 QUALITY CONTROL

A. Contractor shall test and calibrate in-place the flow measuring equipment to demonstrate that it meets the accuracy requirements for the full range of flows specified herein. Record data from each field test shall be recorded and documented in a formal field test report.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 15200

PROCESS PIPING, VALVES, AND INSTRUMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. This specification includes requirements for above- and below-grade process piping located both inside and outside structures, including fittings, valves, instruments, appurtenances, and related items. This includes well screen, well casing, insulation, and valve boxes.

1.02 PROJECT CONDITIONS

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install all process piping, valves, and appurtenances, complete and operational.

B. Contractor shall review installation procedures under this and other sections, and coordinate installation of items that must be installed with or before process piping work.

C. Contractor to provide piping materials and appurtenances as specified and suitable for the service intended. Piping materials, appurtenances, and equipment supplied as part of this contract shall be of equal material and ratings as the connecting pipe, new, and unused, except for testing equipment. Components that serve the same function and are the same size shall be identical products of the same manufacturer. Pipe fittings shall be compatible with the applicable pipe materials.

D. The drawings indicate the general location and arrangement of the piping systems. So far as practical, install piping as indicated. Installed piping shall be free of sags or bends. Exposed piping shall be installed at right angles and parallel to building walls. Locate groups of pipes parallel to each other, spaced to permit servicing of valves and with at least 1 inch of clearance around insulated pipes.

E. For slab, floor, wall, and roof penetrations, keep on site pertinent wall pipes and sleeves before they are required for placement in concrete forms. Verify and coordinate the size and location of building and structure pipe penetrations before forming and placing concrete.

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330:

1. Manufacturer's specifications
2. Technical product data
3. Installation instructions
4. Any other data necessary to demonstrate that pipe and accessories comply with specifications.

B. The Contractor shall prepare and submit an installation schedule of all process piping to facilitate the Engineer's inspections.

C. Contractor shall submit any proposed deviations from the Specifications.

1.04 QUALITY ASSURANCE

A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust, and/or other contaminants. Proper protection and care of material before, during, and after installation is the Contractor's responsibility. Any material found to be damaged shall be replaced at the Contractor's expense. During installation, piping shall be capped to keep out dirt and other foreign matter. A material safety data sheet in conformance with 29 CFR 1910 Section 1200(g) shall accompany each chemical delivered for use in pipe installation. At a minimum, this includes all solvents, solvent cements, glues, and other materials that may contain hazardous compounds. Handling shall be in accordance with ASTM International (ASTM) F 402. Storage facilities shall be classified and marked in accordance with National Fire Protection Association 704. Materials shall be stored with protection from puncture, dirt, grease, moisture, mechanical abrasions, excessive heat, ultraviolet radiation damage, or other damage. Pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendation. Plastic pipe shall be packed, packaged, and marked in accordance with ASTM D 3892.

B. Class numbers or pressure rating and cover conditions shall be clearly marked on the pipe and fittings at the factory.

C. All process pipe and related components must be new and unused.

D. References listed below form a part of this specification to the extent referenced

American Water Works Association (AWWA)

AWWA C500 (2002; R 2003) Metal-Seated Gate Valves for Water Supply Service

AWWA C509 (2001) Resilient-Seated Gate Valves for Water Supply Service

AWWA C510 (2007) Standard for Double Check Valve Backflow Prevention Assembly

AWWA C651 (2005; Errata 2005) Standard for Disinfecting Water Mains

ASME International (ASME)

ASME B1.1 (2003; R 2008) Unified Inch Screw Threads (UN and UNR Thread Form)

ASME B1.20.1 (1983; R 2006) Pipe Threads, General Purpose (Inch)

ASME B16.1 (2005) Standard for Gray Iron Threaded Fittings; Classes 125 and 250

ASME B16.11 (2005) Forged Fittings, Socket-Welding and Threaded

ASME B16.21 (2005) Nonmetallic Flat Gaskets for Pipe Flanges

ASME B16.34 (2004) Valves - Flanged, Threaded and Welding End

ASME B16.5 (2009) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24

ASME B16.9 (2007) Standard for Factory-Made Wrought Steel Buttwelding Fittings

ASME B31.1 (2007; Addenda 2008) Power Piping

ASME B31.3 (2008) Process Piping

ASME B36.10M(2004) Standard for Welded and Seamless Wrought Steel Pipe

ASTM

ASTM A 105/A 105M (2005) Standard Specification for Carbon Steel Forgings for Piping Applications

ASTM A 106/A 106M (2008) Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service

ASTM A 108 (2007) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished

ASTM A 167 (1999; R 2009) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 181/A 181M (2006) Standard Specification for Carbon Steel Forgings, for General-Purpose Piping

ASTM A 193/A 193M (2008b) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

ASTM A 194/A 194M (2009) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both

ASTM A 36/A 36M (2008) Standard Specification for Carbon Structural Steel

ASTM A 53/A 53M (2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 576 (1990b; R 2006) Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality

ASTM A 587 (1996; R 2005) Standard Specification for Electric-Resistance-Welded Low-Carbon Steel Pipe for the Chemical Industry

ASTM A 780/A 780M (2001; R 2006) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

ASTM A 865/A 865M (2006) Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints

ASTM B 124/B 124M (2008a) Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes

ASTM C 552 (2007) Standard Specification for Cellular Glass Thermal Insulation

ASTM D 1527 (1999; R 2005) Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80

ASTM D 1784 (2008) Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

ASTM D 1785 (2006) Standard Specification for Poly (Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120

ASTM D 2466 (2006) Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D 2467 (2006) Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D 2564 (2004e1) Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems

ASTM D 2774 (2008) Underground Installation of Thermoplastic Pressure Piping

ASTM D 2855 (1996; R 2002) Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings

ASTM D 3892 (1993; R 2009) Packaging/Packing of Plastics

ASTM D 3965 (2005) Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings

ASTM F 1290 (1998a; R 2004) Electrofusion Joining Polyolefin Pipe and Fittings

ASTM F 402 (2005) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

ASTM F 438 (2004) Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40

ASTM F 439 (2006) Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80

ASTM F 441/F 441M (2002; R 2008) Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80

ASTM F 493 (2004) Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings

ASTM F 656 (2008) Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings

Ductile Iron Pipe Research Association (DIPRA)

DIPRA TRD (2002) Thrust Restraint Design for Ductile Iron Pipe

International Organization for Standardization (ISO)

ISO 228-1 (2000) Pipe Threads Where Pressure-Tight Joints Are Not Made on The Threads - Part 1: Dimensions, Tolerances and Designation

Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)

MSS SP-25 (2008) Standard Marking System for Valves, Fittings, Flanges and Unions

MSS SP-58 (2002) Standard for Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69 (2003; R 2004) Standard for Pipe Hangers and Supports - Selection and Application

MSS SP-89 (2003) Pipe Hangers and Supports - Fabrication and Installation Practices

Plastics Pipe Institute (PPI)

PPI TR-21 (2001) Thermal Expansion and Contraction in Plastic Piping Systems

SP 6 (2007) Commercial Blast Cleaning

PART 2 – PRODUCTS

2.01. PIPE

A. Carbon Steel Pipe

Carbon steel pipe shall meet the requirements of ASTM A53, Grade A, and shall be in accordance with Pipe Schedule 40. Buried carbon steel piping and fittings shall be Schedule 40.

1. Joints

Carbon steel piping shall primarily be joined by threaded or welding fittings. Dielectric fittings or isolation joints shall be provided between all dissimilar metals.

2. Fittings

Fittings shall be carbon steel. Where cast fittings are not available, segmental welded steel fittings, ASTM A 53/A 53M, Grade B, meeting the requirements of manufacturer's recommended wall thicknesses shall be fabricated.

a. Threaded Fittings

Threaded fittings shall be Class 150, forged carbon steel ASTM A 105/A 105M, conforming to ASME B16.11, and threaded in accordance with ASME B1.20.1. Threaded rigid couplings shall be seamless black carbon steel in accordance with ASTM A 865/A 865M and threaded in accordance with ASME B1.20.1. The proposed pipe thread lubricant/sealant shall be provided to the Engineer for approval. All threaded fittings will subject to zero-tolerance for even minor leaks, due to the nature of the process system.

b. Welding Fittings

Welding fittings shall be butt-welding or socket-welding. Welding fittings shall be forged steel, ASTM A 105/A 105M Class 150 conforming to ASME B16.9, or ASME B16.11.

c. Flanged Fittings

The internal diameter bores of flanges and flanged fittings shall be the same as that of the associated pipe. The flanges shall be welding neck or socket welding type. Flanges and flanged fittings shall be forged steel, ASTM A 105/A 105M, faced and drilled to ASME B16.5 Class 150, with a

0.0625-inch raised face. For tie-in to existing flanges, field-check existing flanges for non-standard bolt hole configurations and design as required to ensure that new pipe and flange mate properly. Bolting shall be alloy-steel ASTM A 193/A 193M hex head bolts and ASTM A 194/A 194M hex head nuts. Bolts shall be provided with washers of the same material as the bolts. Gaskets shall meet the requirements of ASME B16.5.

B. Stainless Steel Well Screens

Stainless steel well screens shall be of the continuous slot design to provide maximum open area, to reduce entrance velocity, and increase hydraulic efficiency. The well screens shall be constructed of trapezoidal wire, continuously wrapped around an array of equally spaced support rods of the same material. Each junction of wire/rod contact shall be resistance welded. The screens and end fittings shall be made of 304 stainless steel.

1. Approved Products

Johnson Screens Water Well and Environmental Screens: 60 wire construction, 0.020-inch slot with plate bottom and NPT threaded top.

C. PVC Pipe

PVC, ASTM D 1784, minimum cell classification 12545-C, pipe shall be Schedule 40 or Schedule 80 in accordance with the plans, and conforming to ASTM D 1785.

1. PVC Joints

The piping system shall be joined primarily by socket-weld connections, except where connecting to unions, valves, and equipment with threaded or flanged connections that may require future disassembly. Connections at those points shall be threaded and back-welded.

2. PVC Fittings

The schedule rating for the fittings shall not be less than that for the associated pipe. Fittings shall be ASTM D 1784, PVC conforming to the requirements of ASTM D 2466, socket type, or ASTM D 2467, socket type. The thread lubricant proposed by the Contractor shall be provided to the Engineer for approval. All threaded fittings will subject to zero-tolerance for even minor leaks, due to the nature of the process system.

a. Flanged Fittings

Flanges and flanged fittings shall be Class 150, one piece, molded hub type, flat-faced, and shall conform to ASME B16.5. Flanged connections shall have the same pressure rating as the pipe or greater. Bolting shall be stainless steel ASTM A 193/A 193M hex head bolts and ASTM A 194/A 194M hex head nuts. Bolts shall be provided with washers of the same material as the bolts. Gaskets shall be full-faced, maximum 1/8-inch thick, fabricated from ethylene propylene rubber (EPR) in accordance with ASME B16.21. When the mating flange has a raised face, a flat ring gasket shall be used, and a filler gasket shall be provided between the outer diameter of the raised face and the flange outer diameter to protect the PVC flange from bolting moment.

b. PVC Solvent Cement

Socket connections shall be joined with PVC solvent cement conforming to ASTM D 2564. Manufacture and viscosity shall be as recommended by the pipe and fitting manufacturer to ensure compatibility. Joints shall be prepared with primers conforming to ASTM F 656 prior to cementing and assembly.

D. CPVC Pipe

CPVC, ASTM D 1784, minimum cell classification 23447, pipe shall be Schedule 40 or 80 conforming to ASTM F 441/F 441M. All CPVC, whether slotted or unslotted, shall be from the same manufacturer.

1. CPVC Well Screens/Slotted Pipe

CPVC well screens and slotted pipe sections shall be custom machine slotted Schedule 80 CPVC pipe. Soil vapor extraction (SVE) well screens shall have a flat capped end. Slot size shall be 0.020 inch, and spacing shall be 0.1875 inch with four rows of slots.

2. CPVC Joints

The piping system shall be joined by socket-weld flanged or mechanical connections, except where connecting to unions, valves, and equipment with threaded connections that may require future disassembly.

3. CPVC Fittings

The schedule rating for the fittings shall not be less than that for the associated pipe. Fittings shall be ASTM D 1784, cell classification 23447, CPVC conforming to the requirements of ASTM F 438, socket type ASTM F 439, socket type. The thread lubricant proposed by the Contractor shall be provided to the Engineer for approval.

a. Expansion Fittings

(1) Sliding expansion joints shall be telescoping design with triple FKM O-ring seals, including center pressure seal and outer debris seals, and internal support piston with maximum joint travel length shall be 6 inches.

(2) Flexible expansion joints shall be elastomer tube design with double union end connectors. Elastomer tubes shall be double spherical arch constructed from reinforced Neoprene. All unions shall be constructed from CPVC with buttress threaded union nuts and choice of socket connections.

(3) Approved Products: Spears Expansion Joints

b. Well Plug

(1) Well plugs must be H type with wing nut and expandable gasket to form watertight seal.

(2) Approved Products: EcoPlug, Morrison Bros FIG 678XA

c. Flanged Fittings

Flanges and flanged fittings shall be Class 150, one piece, molded hub type, flat-faced, and conforming to ASME B16.5. Flanged connections shall have the same pressure rating as the pipe or greater. Bolting shall be stainless steel, ASTM A 193/A 193M, hex head bolts, and ASTM A 194/A 194M, hex head nuts. Bolts shall be provided with washers of the same material as the bolts. Gaskets shall be full-faced, maximum 0.125-inch thick, fabricated from EPR in accordance with ASME B16.21. When the mating flange has a raised face, a flat ring gasket shall be used, and a filler gasket shall be provided between the outer diameter of the raised face and the flange outer diameter to protect the CPVC flange from the bolting moment.

4. Solvent Cement

   Socket connections shall be joined with PVC solvent cement conforming to ASTM F 493. Manufacture and viscosity shall be as recommended by the pipe and fitting manufacturer to ensure compatibility.

5. Approved Products: Safe Water Technologies Custom Machine Slotted Laterals

E. PVC Tubing

PVC tubing shall be flexible clear braid reinforced PVC hose conforming to NSF-61.

1. Fittings

   Fittings shall be polyethylene push-on barb type rated at a minimum of 100 pounds per square inch.

2. Approved Products: Nylobrade tubing and Thermobarb fittings

2.02. VALVES

A. Valves shall include all accessories (such as actuator, handwheel, extension stem) required for a complete operation. The valves shall be suitable for the intended service and location. Renewable parts are not to be of a lower quality than those specified. Valve ends shall be compatible with and the same size as adjacent piping system. An operator shall be sized to operate the associated valve for the full range of pressures and velocities. Valves will open by turning counterclockwise. Operators, actuators, and accessories shall be factory mounted.

B. Where two or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

C. As a minimum, unless otherwise indicated or recommended by the reference standards, test valves in accordance with the manufacturer's standard procedure.

D. Butterfly Valves

Butterfly valves shall have a manual, locking hand lever.

1. Carbon steel butterfly valves shall have carbon steel bodies and wafer styled end connections. Discs shall be contoured stainless steel. The valve shafts shall be stainless steel with self-lubricating, corrosion-resistant sleeve type bearings. Valve seats shall be attached to either the valve body or the disc, and shall be constructed

of Teflon. Valves shall be rated for 150 psig service at 140 degrees Fahrenheit (°F).

2. PVC butterfly valves shall have wafer style bodies constructed of PVC.

   Valves shall have PVC discs, ethylene propylene diene monomer (EPDM) seals and seats, lever manually actuated operators. Valves shall be rated for 150 psig service at 140°F.

   Approved Products: Hayword BYCS Series

E. Check Valves

Check valves at the end of pump suction lines shall be "foot valves" with strainer. The "elastic hinge foot valve" body shall be of carbon steel construction with stainless steel screen (0.125-inch perforation) with Buna-N seals.

Approved Products: Sure Flow type FVRM-150CC

F. Gate Valves

Gate valves shall have forged steel bodies and stems, welded or bolted bonnets, and a single solid wedge. Valves shall be rated for a minimum of 175 psig service and conform to at least ASME B16.34 Class 150. End connections shall be flanged. Valves shall be equipped with handwheel operators.

Approved Products: M&H C-509 Style 3067-02 or Kennedy

G. Ball Valves

1. Carbon steel ball valves shall be full port single or multi-piece body type with cast iron bodies and ASME B16.11 threaded ends or ASME B16.5 flange x flange. Valves shall have polytetrafluoroethylene (PTFE) packing and seats, a stainless steel ball, and stainless steel hand lever operator. Valves shall be rated for 150 psig service at 150°F.

   Approved Products: Nibco T-580-CS-R-66 (under 2")

2. CPVC ball valves shall be full port, true union with PTFE seals.

   Approved Products: Parker

H. Globe Valves

Globe valves shall be globe style and shall have carbon steel bodies, with stainless steel trim, and carbon steel bolted bonnets. Valves shall conform to ASME B16.34 Class 150, and shall have ASME B16.1 flanged or ASME B16.11 threaded end connections.

Valves shall include rising stems, conventional discs constructed of PTFE, and stainless steel rings. Valves shall be rated for 1.4 MPa 200 psig service. Valves shall be equipped with handwheel operators.

I. Diaphragm Valve

Diaphragm valves shall have carbon steel bodies, 150 flanged end connections, and PTFE seals, and are manually actuated. Position indicators shall be provided to indicate diaphragm position. Valves shall be rated for 150 psig service at 140°F.

Approved Products: Saunders

J. Drains

1. Valved drains may or may not be shown on the detailed piping and instrumentation diagrams; their absence will not relieve the Contractor of the responsibility for providing and installing them as needed to complete the piping system for the use intended.

2. All liquid pipeline low points shall be drained.

    a. For pipelines 2.5 inches and larger, drains shall be 0.75 inch and equipped with ball valves. For pipelines 2 inches and smaller, drains shall be 0.5 inch and equipped with ball valves.

K. Vent Valves

Vent valves are 0.5-inch "thumb"-actuated valves with male NPT threads that shall be installed (tapped) directly into the process line. The body shall be carbon steel, and the stem and vent tube shall be stainless steel (Type 316).

Approved Product: Parker Bleed Valve (8M-BV8-S)

L. SAMPLE PORTS

Sample ports shall be provided as indicated in the piping and instrument diagrams to complete the piping systems for the use intended. The sample ports shall be located in easily accessible locations, and shall avoid potential stagnant points and/or areas where material could collect. Sampling ports shall be comprised of pipe fittings, pipe, and ball valves that comply with material, temperature, and pressure requirements of the associated piping system as specified elsewhere in this Section.

M. MISCELLANEOUS PIPING COMPONENTS

1. Air Release and Vacuum Breakers

Air release vents shall be located, and vented, such that a hazardous atmosphere will not be created upon operation. Air release and vacuum breakers shall be located as indicated on the contract drawings.

Vacuum breakers 2 inches and smaller shall be an angle type with all bronze bodies and bonnets, and shall be installed at least 6 inches above the flood line of associated equipment.

2. Backflow Preventer

The backflow preventer shall be identical in size to pipe. Total head loss through the complete backflow assembly shall not exceed 10 psi at rated flow.

3. Cam and Groove (Cam-lock) Connections

Where cam and groove hose couplings are required, they shall be 3-inch stainless steel. Each hose end shall include the associated dust plug/cap. Where accessible, cams should be taped with warning tape. Connections should also include isolation valves, and associated pressure gauges. Cam and groove fittings are specified for connection to the hot water boiler and chiller (see P-106).

4. Hot Water Pipe Insulation

Hot water pipes (1.5-and 3-inch carbon steel pipe) shall be insulated with form fitting EPDM pipe insulation. 1.5-inch pipes shall have 1-inch thick insulation, and 3-inch pipes shall have 1-inch thick insulation. In addition to insulation, the injection well hot water pipe manifold (located in the SVE enclosure) shall be foil wrapped with foil-backed tape.

2.04. INSTRUMENTS

A. Pressure and Vacuum

1. Gauge

Gauges shall have polycarbonate front and back cover, anodized aluminum extruded housing with recessed grooves, polycarbonate overlay, Buna-N O-rings, and 316L Stainless Steel sensor construction. Connections shall be 0.25-inch male NPT threaded connections.

Approved Products: Dwyer DPG-200 (for indicator, transmitter, and switch in-one) Dwyer DSGT (for indicator and transmitter in-one)

2. Differential Pressure Transmitter

The differential pressure transmitter for measuring the differential pressure across the school concrete floor shall have a minimum range of -2 to 2 inches water column (IWC). The unit will be battery powered, and WIFI LAN-capable with either an integral WIFI antenna or the capability of interfacing with a WIFI node or radio (also battery powered). Process connections shall be 0.25 or 0.5 inch barbed connections. The differential pressure transmitter shall be enclosed in a polycarbonate case, and rated NEMA 4X.

Approved Products: ThermoScientific SmartVu dP sensor (integral WIFI)

B. Temperature

1. Gauge

Thermometers shall be bi-metal actuated, with 3-inch dials that have external calibration adjustment and stainless steel cases. Mercury shall not be used in thermometers. The thermometers shall have stainless steel stems, adjustable angle type for the correct viewing angle. The union connections with associated thermowells shall be included. Scale shall be 1°F from 50 to 17°F with accuracy within one scale division.

2. Probe

The Temperature/Level probes shall be a single unit designed to measure both the liquid level (piezoresistive) and temperature (-4 to 176°F). The probe body shall be titanium with silicon temperature sensor.

Approved Product: In-Situ Troll 500 with Data Logger.

C. Level

1. Probe

The Temperature/Level probes shall be a single unit designed to measure both the liquid level (piezoresistive) and temperature (-4 to 176°F). The probe body shall be titanium with silicon temperature sensor.

Approved Product: In-Situ Troll 500 with Data Logger.

2. Switch

Level switch shall be mounted above the moisture separator and have at least three conductive stainless steel electrodes: one for high-high level, one for high level (pump on) and one for low level (pump off).

Approved Product: Dwyer DPL110

The level switch for the oil-water separator oil drum shall be a float-type intrinsically safe probe.

The level switch for the water treatment equalization tank shall be of the ultrasonic type capable of alarm switches and 4-20 mA signal to the local pump controller for maintenance of constant tank level.

Approved Product: Magnetrol

School injection well vault level high-high level switches shall be configurable as NC for a series loop of several level switches. This loop is connected to a WIFI node/radio for communication of high-high alarm conditions to the WIFI LAN and treatment system PLC.

Approved Product: Whitman level switch L20-16-S1-NO

PART 3 – EXECUTION

3.01 INSTALLATION

A. Contractor shall inspect all process piping and appurtenances prior to and after installation.

B. Contractor shall follow manufacturers' guidelines for inspection, storage, handling, installation, and testing of all piping and appurtenances.

C. Contractor shall allow inspection of all installed pipe before backfilling or insulating.

3.02 QUALITY CONTROL

A. Carbon Steel Pipe Leakage Tests

1. Carbon steel pipe shall be leak-tested from the injection water booster pumps (P-201 and P-202) to the glove valve within the injection well valve box. After the pipe is laid and all valves and instruments are installed, the trench can be partially backfilled, leaving the joints exposed for examination. The pipe shall be subjected to hydrostatic test pressure of 100 psi, and will retain 90 percent of the pressure for 2 hours. Each valve within the tested zone shall be opened and closed several times during the test. Exposed pipe, joints, fittings, and valves shall be carefully examined during the test. Any visible leaks shall be repaired and/or defective equipment replaced as necessary. The test shall be repeated until the results are satisfactory. The final leak test must be supervised by the Engineer, and backfilling shall not be completed until results have been accepted and approved by the Engineer.

B. CPVC Pipe Leakage Test and Inspection

1. The CPVC and PVC piping installed for the SVE system doesn't lend itself to traditional leak-testing due to the nature of the piping and the lack of isolation. All CPVC, PVC, and PE tubing shall be visually inspected by the Engineer prior to backfilling or putting into service.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 15518

STEAM BOILERS AND EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

A. An approximately 4,800,000-Btu per hour (BTU/hr) rental boiler mounted in a portable enclosure will be used to provide 15pounds-per-square-inch gauge (psig) steam to heat via a heat exchanger up to 60 gallons per minute (gpm) of treated groundwater from approximately 50 to 160 degrees Fahrenheit (°F) for injection into the subsurface of the Skykomish School (the School) in Skykomish, Washington. The condensate from heating the treated groundwater will be returned to the boiler. Skykomish City water will be used for makeup. No. 2 diesel will be used as fuel.

The portable enclosure may be a semi-trailer van up to 45 feet long, or an 8- by 20- or 40-foot shipping container. The portable container shall contain the boiler, boiler controls, makeup water treatment as required, and the steam to water heat exchanger.

1.02 PROJECT CONDITIONS

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish a hot water boiler.

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330:

1. Manufacturer's specifications
2. Technical product data/sizing calculation, including heating surface and volume measurements, including heat release calculations and performance data at minimum, 25 percent, 50 percent, 75 percent, and 100 percent load sufficient to establish compliance of boilers with heat release requirements. Base calculations on the specified efficiency and capacity.
3. Installation instructions and operations and maintenance manual (two copies)
4. Information required to complete Washington Clean Air Act (RCW 70-94.152) and WAC 173-400-110 permit applications
5. Rental Boiler Operating Permit required by the State of Washington Administrative Code, Department of Labor & Industries (Boiler Section)
6. Operational inspection on rental boiler installation
7. Start-up plan
8. Start-up certification
9. Submit evidence that boilers meet requirements of standards specified. Include with the certificate of compliance acceptable evidence that standards are met. Acceptable evidence will be the official Underwriters Laboratories (UL) listing mark prescribed in the UL gas and oil equipment list for oil-, gas-, or gas- and oil-fired boiler assemblies, as applicable plus the appropriate official ASME

International (ASME) symbol stamp. In lieu of the above certification, acceptable evidence will be a test report from an independent testing laboratory indicating that the boilers and accessories have been inspected and tested, and meet requirements of the applicable standards specified.

B. Contractor shall submit any proposed deviations from the Specifications.

1.03 QUALITY ASSURANCE

A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust, and/or other contaminants.

B. Provide the services of a qualified engineer or technician for start-up and installation of equipment as specified below. One engineer or technician appointed by the Contractor shall supervise and be responsible for the overall installation, start-up, test, and checkout of systems.

C. Provide an installation engineer or technician to install and supervise the installation of the steam boiler system, including instrumentation and boiler controls. Provide the technician or engineer until the installation of equipment is coordinated and checkout completed.

D. Submit a written schedule with dates of start-up tests, installation, and checkout of equipment.

E. Start-up and test engineer or technician shall be approved by the manufacturer of the specific piece of equipment, including boiler, boiler controls, boiler instrumentation, and feed water equipment.

F. After installation of equipment, the engineer or technician shall submit a signed certificate or certified written statement that the equipment is installed in accordance with the manufacturer's recommendations.

G. References listed below form a part of this specification to the extent referenced

ASME

ASME B40.100 (2013) Pressure Gauges and Gauge Attachments

ASME BPVC SEC I (2010) BPVC Section I-Rules for Construction of Power Boilers

ASME BPVC SEC VIII (2010) Boiler and Pressure Vessel Codes: Section VIII Rules for Construction of Pressure Vessel

ASME BPVC SEC VIII D1 (2010) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1

ASME CSD-1 (2012) Control and Safety Devices for Automatically Fired Boilers

ASTM International (ASTM)

ASTM D396 (2013c) Standard Specification for Fuel Oils

National Board of Boiler and Pressure Vessel Inspectors (NBBI)

NBBI NB-27 (1991) National Board Rules and Recommendations for the Design and Construction of Boiler Blowoff Systems

PART 2 – PRODUCTS

2.01. HOT WATER BOILER AND RELATED EQUIPMENT

A. Boilers

Firetube type (horizontal return tubular and horizontal fire box). Boiler shall have gross output capacity of at least 4,800,000 BTU/hr when operating at a steam pressure of 15 psig at the site under design conditions when the burner is firing No. 2 oil conforming to ASTM D396. Oil-fired boilers shall have a steady state combustion efficiency of at least 83 percent when fired at the maximum- and minimum-rated capacities that are provided and allowed by the controls. Boilers shall comply with local, state, and federal emission regulations for the fuel being used. Smoke emission shall not exceed Ringlemann No. 1, except during start-up, cleaning, or soot blowing. Boiler furnaces shall be equipped with combustion control safety devices conforming to ASME CSD-1, for boilers of less than 12,500,000 BTU/hr thermal heating capacity. Combustion controls shall be of the modulating-positioning type. Provide connections for remote starting or stopping of the boiler. Boiler shall be automatic start.

1. Boiler Shell

   The boiler shell must be constructed in accordance with ASME BPVC SEC I.

2. Boiler Connections

   Requirements for interconnecting piping, insulation, fuel supply, and other related work necessary to provide a complete and operable steam system, whether or not specifically mentioned above, shall conform to applicable requirements of other sections.

3. Boiler Instrumentation

   a. A flue gas temperature gage.

   b. A draft gage, single point, conforming to ASME B40.100.

   c. Volumetric fuel flow meter.

   d. Pressure gauges conforming to ASME B40.100 for indicating steam pressure in main steam header, and for indicating feed water pressure.

4. Boiler Plant Controls and Instruments

   a. Mode of Operation

      Burner operation shall be full modulation principle. The burner shall always return to low fire position for ignition.

      The steam pressure controls to regulate burner operation shall be mounted near the water column. Controls shall be a high limit (manual reset), operating limit (auto reset), and firing rate control.

b. Blower

Air for combustion shall be supplied by a forced draft blower mounted in the front boiler door, above the burner, to eliminate vibration and reduce noise level.

c. Combustion Air Control

Combustion air damper and cam-operated fuel metering valves shall be operated by a single damper control motor that regulates the fire according to load demand. Potentiometer-type position controls shall be provided to regulate operation of the damper control motor.

d. Light Oil Fired

Burner Type: The burner, integral with the front head of the boiler, shall be a combination of the low pressure air atomizing type for oil and high radiant multi-port type for gas. The burner shall be approved for operation with Commercial No. 2 Oil.

e. Oil Burner

Oil Pump: An oil pump with a capacity of approximately twice the maximum burning rate shall be included. Separate motor-driven pump set, shipped loose, to be installed in a location favorable to the oil storage tank, shall be provided.

Oil Burner Piping: Fuel oil piping on the unit shall include oil pressure regulating devices, oil metering controls, solenoid shutoff valves, pressure gauges, and fuel strainer, all integrally mounted on the unit. A fuel oil controller shall be provided to combine all of the fuel oil controls into a single casting that is mounted on the front door of the unit. A single tip retractable nozzle shall be used for the low-pressure air atomizing burner. A low-oil-pressure switch shall be included in the oil piping.

Belt-driven air compressor, lubricating air tank, oil level indicator, inlet air filter, air pressure gauge, and low atomizing air pressure switch shall be provided.

f. Burner Turndown

Turndown range of the burner shall be at least 4:1.

g. Boiler Flame Safeguard Controller and Control Panel

Controller shall be computerized solid state having sequence and flame-on lights and alpha-numeric "first out" fault indications of flame safeguard trip functions. It shall include dynamic self-check logic. The controller shall have a fixed operating sequence incapable of being manually altered. The sequence shall include start, pre-purge, pilot, and main fuel ignition run and post-purge cycles.

Controller shall be the non-recycle type for maximum safety that shall shut down the burner and indicate as a minimum the following trip functions: pilot and main flame failure, high and low fire proving switch faults, locking interlocks open, false flame signal and fuel valve open (when proof of closure switch is furnished).

The controller shall have a run/test switch. It shall allow interruptions to sequence just after pre-purge, during pilot ignition trial, and run cycles for adjustments to firing rate motor, damper linkages, and pilot flame for minimum turndown tests.

Control Panel: The control panel shall be mounted on the front door of the boiler in a location convenient to the operator. The panel shall contain the boiler flame safeguard controller, blower motor starter, indicating lights, and selector switches. The hinged metal cabinet will have NEMA 1A rating that includes a neoprene dust seal.

The panel shall contain the following lights and switches:

Lights

White - load demanded.

White - fuel valve open.

Red - low water.

Red - flame failure.

Control Switches

Burner On-Off.

Manual-Automatic.

Manual Firing Rate Control.

Oil-, heat-, and moisture-resistant wire shall be used and identified with circuit numbers corresponding to the electrical wiring diagram.

All electrical equipment and wiring shall be in conformance with UL requirements.

Boiler shall be supplied with a control circuit transformer and fuse protection for the control circuit.

Flame Safeguard: The system shall consist of a computer-based boiler controller and solid state sensors totally integrated to provide automatic burner sequencing, flame supervision, and indications of system status, faults, and self-diagnostics.

The boiler controller shall consist of chassis, program module, keyboard display, and flame signal amplifier. It shall be the non-recycle type and have a fixed operating sequence incapable of being manually altered. The sequence shall include standby, pre-purge, pilot, main fuel ignition, and run, and post-purge periods.

The system shall incorporate full modulating control of fuel and combustion air as well as firing rate control based on system demand.

The boiler controller shall have a non-volatile memory that retains history files and sequence status after interruptions.

An 80-character, 2-line liquid crystal display (LCD) and keyboard shall be provided to adjust control settings and display 73 fault messages, 12 diagnostic messages, 38 historical messages, and system status messages, and operating pressures and temperatures. The boiler firing rate shall also be displayed in addition to the last six lockouts and boiler operating information when the lockout occurred. Provisions for a security access code shall be provided.

Separate status indicators will show:

Ready: controller operational.

Demand: call for heat.

Main Valve: fuel valve open.

Low Water: low water condition.

Alarm: safety shutdowns.

The boiler controller shall incorporate a five-function run/test switch.

The system shall be characterized for each individual model boiler. The system shall also incorporate a tailored pre-purge cycle that minimizes pre-purge energy losses while maintaining the maximum required air changes. It shall permit the user to select a specific rate control program for precise load tracking that reduces on-off cycling due to load swings. The system shall also provide an integrated thermal stress protection program to prolong boiler life. An assured low-fire cutoff feature also shall be provided.

The system shall monitor inputs from solid state sensor for oil pressure and temperature. A single solid state sensor shall be used for both on-off and proportioning control of the burner. The high/low limits and operating set points of all sensors will be programmable from the keyboard display. The system shall be capable of detecting a jumpered or defective sensor. A dynamic check of the gas pressure sensor shall be made prior to the main flame establishing period to ensure it is fully operational.

An optional two-way communications module with built-in modem to allow for remote control of non-safety settings and monitoring of up to six boilers also shall be available. Up to three pre-programmed telephone numbers shall be called in the event of a fault condition. Options such as Lead/Lag, Boiler Efficiency, and Heating Boiler packages can be interfaced to this module without any change to the existing system structure. The communications module shall be able to interface with a personal computer.

Control Transformer: - Boiler to be supplied with a control circuit transformer and fuse protection for the control circuit.

h. Noise Levels

Noise measurements and exposure analyses should be conducted under the overall supervision of an industrial hygienist. Exposure limits for potentially hazardous noise levels of 85 dBA, continuous or intermittent, and 140 dB peak sound pressure, impulse or impact, shall be maintained. The sound

level meter shall conform as a minimum to the Type 2 requirements cited in ASA S1.4.

B. Hot Water Heater

The boiler system shall be equipped with a steam to water heat exchanger conforming to ASME BPVC SEC VIII. Heaters shall have gasketed cast iron or steel flange mountings and shall be designed, fabricated, and tested to withstand a minimum of 150 psig maximum working pressure at 250°F. The pressure drop through the coil at maximum temperature and flow rate shall not exceed 5 psig at a flow rate of 60 gpm. The coils shall terminate in threaded inlet and outlet connections on the end of the heat exchanger, and shall be designed for the indicated temperature rise and maximum draw rate. The steam inlet shall be flanged.

C. Blowdown Equipment

Furnish the boiler with all equipment, tanks, and controls necessary for bottom blowdown of the boilers. The equipment for bottom blowdown systems shall include a blowdown tank and sample cooler. Install and pipe blowdown equipment as indicated, and conform to recommendations of the NBBI NB-27, Recommended Rules for National Board Boiler Blowoff Equipment.

1. Bottom Blowdown Tank

Blowdown tank shall be fabricated of welded steel plate in accordance with ASME BPVC SEC VIII. Tank shall be a vertical cylindrical tank designed for the working pressure of the boiler(s). Tank shall be equipped with a tangential blowdown inlet located so as to impinge on a carbon steel wear plate extending at least 180 degrees around the interior circumference of the tank from the point of inlet. Tank shall be equipped with an internal overflow, vent, drain, safety relief valve, and gage glass with try cocks, blowdown cock, and guard. Tank interior shall be protected by an epoxy coating system suitable for continuous water immersion and operation at a minimum temperature of 300°F.

2. Sample Cooler

Provide a water-cooled, shell-and-tube, or shell-and-coil-type heat exchanger designed for cooling sample of boiler water prior to chemical testing. Furnish the sample cooler as a component of the packaged continuous blowdown system when such a system is being furnished. The cooler shall consist of a cast iron or steel shell with copper coil or copper alloy tubes, and shall be equipped with a brass or bronze sampling cock.

D. Feed water Equipment

1. Boiler Feed Pumps

Pumps may be of centrifugal or peripheral-turbine type with cast iron casing, and shall be bronze or alloy steel fitted. For turbine type pumps, provide pressure relief valves and for centrifugal type pumps, provide bypass orifice. Packed stuffing boxes or mechanical seals suitable for the design conditions indicated shall be provided. Pumps shall be designed for the net positive suction head, discharge head, and water temperature indicated. Capacity of each pump under the above conditions shall be not less than the following percentage of maximum

total boiler capacity: centrifugal pumps 125 percent; turbine pumps 150 percent. Pump motors shall be totally enclosed.

2. Surge Tank and Transfer System

The condensate storage and surge tank shall be a cylindrical welded steel tank mounted and supported as indicated. The tank shall be designed and constructed in accordance with the ASME BPVC SEC VIII D1 for the indicated working pressure. Storage capacity shall be sufficient to provide adequate water to the deaerator for 10 minutes of boiler operation at maximum capacity. Inlet connections for condensate and makeup water shall be as indicated. The tank shall be equipped with liquid level controllers and valves and alarms as indicated. Tank shall be equipped with pressure and temperature gages, water level gage, vent, drain, and overflow. Tank shall be epoxy coated. Surge tank assembly shall include condensate transfer pumps and interconnecting piping, including strainer and control box as indicated. Transfer pumps, except for head and temperature requirements, which shall be as indicated, shall conform to requirements for boiler feed pumps specified herein.

3. Feed Water Treatment Equipment

a. Feed Water Characteristics

Equipment for the chemical treatment of the boiler makeup feed water shall be designed to reduce the boiler water concentrations to the limits specified by the manufacturer.

Raw water shall be delivered to the plant from the water distribution system of the City of Skykomish at a normal pressure of 40 psig. Contractor shall determine the water chemical concentrations of the raw water.

b. Water Softener

The contractor shall supply water softening equipment sufficient to treat raw water to the requirements specified by the boiler manufacturer.

4. Feed Water Test Equipment

Provide for the determination of boiler water condition, which includes an assembly of indicator solutions, standardized solutions, and test glassware with cabinet. The solution types shall permit tests for water hardness, total alkalinity, hydroxide, carbonite alkalinity, and chloride content in milligrams per liter. Feed water test equipment shall employ a standardized soap solution for hardness test and a dilute sulfuric acid solution with a methyl orange indicator for total alkalinity. The hydroxide and carbonate alkalinity shall be determined with a phenolphthalein indicator and the chloride content, with a silver nitrate solution. Furnish standardized phenolphthalein color slides for accuracy in alkalinity tests.

E. Electric Motors

Motors that are not an integral part of a packaged boiler shall be rated for high efficiency service per Section 26. Motors that are an integral part of the packaged boiler system shall be the highest efficiency available by the manufacturer of the packaged boiler.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Arrange work in a neat and orderly manner so that minimum storage of equipment and material is required at the project site. Install equipment and material in accordance with the best commercial practices. A competent installation engineer or technician as stated in paragraph "Qualifications of Engineer" shall assemble an unassembled boiler-burner package in strict accordance with the manufacturer's instructions. Systems shall be neat in appearance, compact, adequate in construction and assembly, and installed for long and continuous service. Parts shall be readily accessible for inspection, repair, and renewal. Inspect equipment and material upon delivery and test after installation. Protect material and equipment from the weather. Repair damage caused by the Contractor in execution of the work, and leave in a condition equal to that existing before work was started.

1. Equipment Foundations

   Locate portable equipment enclosure as shown on the Treatment Area Gravel Pad as shown on Plans. Install piping in such a manner so as not to place a strain on equipment.

2. Piping

   Insulated above-ground and below-ground pipes and hoses shall be used.

3.02 QUALITY CONTROL

Perform inspections and tests as specified herein to demonstrate that the boiler(s) and auxiliary equipment, as installed, are in compliance with contract requirements. During boiler system start-up tests, factory-trained engineers or technicians employed by individual suppliers of such components as the burner, flame safeguard and combustion controls, feed water treatment equipment, and other auxiliary equipment shall be present, as required, to ensure the proper functioning, adjustment, and testing of individual components and systems. No bypassing, use of jumpers, or other disablement of control systems will be allowed unless specified elsewhere. Labor, equipment, fuel, and test apparatus required for testing shall be furnished by the Contractor. Rectify defects disclosed by the tests by the Contractor within time period specified.

A. Inspections and Test

   Make inspections and tests at the site under the direction of and subject to the approval of the Engineer. The Contractor shall operate the boiler and appurtenances prior to final testing and shall ensure that necessary adjustments have been made. A 24-hour written notice shall be submitted to the Engineer indicating the equipment is ready for inspection or testing.

B. Preliminary Operational Test

   Operate each boiler and appurtenances prior to final testing, and ensure that necessary adjustments have been made. Provide testing equipment required to perform tests. During this testing period, provide operating instructions and training to persons tasked with operation of the boiler. Tests shall be accomplished with both fuel types on dual fuel units.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 15540

WATER PUMPS: CENTRIFUGAL AND DIAPHRAGM

PART 1 – GENERAL

1.01 SUMMARY

A. This specification covers the requirements for centrifugal and diaphragm pumps. Relevant sheets for centrifugal pumps are P-101, P-104, and P-105. For diaphragm pumps see P-107.

B. Related Sections:

1. Section 02600 – Electrical

1.02 PROJECT CONDITIONS

A. Expected backup generator loads consist of SVE Blower (15HP) - 17.46 KVA, Moisture Separator Transfer Pump (1 HP) - 1.75 KVA, 240/120V Panel - 25.98 KVA (This Panel will require 30 KVA step-down transformer). The generator will have a combine connected load of 45.19 KVA with a demand load of 49.08 KVA. A 60 KW generator is required to accommodate all loads

1.03 SUBMITTALS

A. All submittals shall be completed in accordance with Section 01330 - Submittal Procedures.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Product data shall include but shall not be limited to the following:

1. Paragraph-by-paragraph specification-compliance statement, describing the differences between the specified and the proposed equipment.

2. Manufacturer's certification of prototype testing.

3. Manufacturer's published warranty documents.

4. Manufacturer's installation instructions.

C. Shop Drawings: Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer’s standard product data, including but not limited to shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.

D. Wiring Diagrams: Submit wiring diagrams detailing power, signal, and control systems, clearly differentiating between manufacturer-installed wiring and field-installed wiring, and between components provided by the manufacturer and those provided by others. Submit interconnection wiring diagrams showing external connections required; with field wiring terminals marked in a consistent point-to-point manner.

E. Pump curves

F. Operation and Maintenance Data: Submit operation and maintenance data to include in operation and maintenance manuals

G. Additional submittals shall be in accordance with other specifications herein.

1.04 QUALITY ASSURANCE

A. Provide the services of a manufacturer's representative experienced in the installation, adjustment, and operation of the equipment specified. The representative shall supervise the installation, adjustment, and testing of the equipment. The manufacturer shall be ISO 9001-certified and shall be designed to internationally accepted standards.

B. References listed below form a part of this specification to the extent referenced

Hydraulic Institute (HI)

HI 1.1-1.2 (2008) Rotodynamic (Centrifugal) Pump for Nomenclature and Definitions

National Electrical Manufacturers Association (NEMA)

NEMA MG 1 (2011; Errata 2012) Motors and Generators

National Fire Protection Association (NFPA)

NFPA 20 (2013) Standard for the Installation of Stationary Pumps for Fire Protection

NFPA 30 (2012; Errata 2011) Flammable and Combustible Liquids Code

NFPA 37 (2010; TIA 10-1; TIA 13-2; TIA 13-3) Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

NFPA 70 (2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code

The Society For Protective Coatings (SSPC)

SSPC Paint 21 (1982; E 2004) White or Colored Silicone Alkyd Paint (Type I, High Gloss and Type II, Medium Gloss)

SSPC Paint 25 (1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

U.S. National Archives and Records Administration (NARA)

47 CFR 15 Radio Frequency Devices

Underwriters Laboratories (UL)

UL 448 (2007; Reprint Jul 2013) Centrifugal Stationary Pumps for Fire-Protection Service

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.1.1 Standard Products

Provide material and equipment that are the standard products of a manufacturer regularly engaged in the manufacture of such products and that essentially duplicate equipment that has been in satisfactory waterworks operation at least 2 years prior to bid

opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the jobsite. Pumps and motors of the same types shall each be the product of one manufacturer.

2.1.2 Description

The pumps shall be horizontal and vertical centrifugal water pumps and electric diaphragm pumps of the types indicated and specified. The single driving units for the pumps shall be electric motors.

2.1.3 Nameplates

Pumps and motors shall have a standard nameplate securely affixed in a conspicuous place showing the manufacturer's name, address, type or style, model, serial number, and catalog number. In addition, the nameplate for each pump shall show the capacity in gallons per minute (gpm) at rated speed in rpm and head in feet of water. Nameplate for each electric motor shall show at least the minimum information required by 10.38 NEMA MG 1.

2.2 CENTRIFUGAL WATER PUMPS

The pumps shall be the centrifugal single-stage designed for waterworks service in the following configurations:

	Pump No.
Horizontal	P-101 – P-110, P-201

2.2.1 Pump Service

The pumps shall be utilized for the following service:

	Pump No.
Groundwater pumps	P-101 – P-110
Treated groundwater	P-201

2.2.2 Pump Drives

The pumps shall have the following driving units and shall be directly connected to the driving units through solid shafts.

	Pump No.
Electric motor drive	P-101 – P-110, P-201
Variable speed drive	P-101 – P-110, P-201

2.2.3 Pump Construction

Except as below specified, centrifugal water pumps shall be constructed in accordance with Hydraulic Institute HI 1.1-1.2.

2.2.4 Pump Characteristics

The pumps shall be capable of discharging quantities at total discharge heads measured at the discharge flange, between the following limits:

Pump No.	gpm at total discharge head, ft. H(2)O	gpm at total discharge head, ft. H(2)O	T, max degrees F
P-101 – P-110	20 gpm, 90 ft H(2)O	6 gpm, 40 ft H(2)O (VFD)	130
P-201	80 gpm, 100 ft H(2)O	60 gpm, 40 ft H(2)O	160

Pumps shall operate at optimum efficiencies to produce the most economical pumping system under the conditions encountered and shall be sized to make optimum match with the system head curve as shown. Suction lift on pump No P-101 – P-110 will be not more than 15 feet. The shutoff total head shall be not greater than 120 percent of total rated head.

2.2.5 Pump Casings

All pump casings shall be cast iron.

The casings shall be designed to permit replacement of wearing parts. Horizontal-split casings shall have the suction and discharge nozzles cast integrally with the lower half, so that the upper part of the casings may be removed for inspection of the rotating parts without disturbing pipe connections or pump alignment. Pump casings shall be of uniform quality and free from blowholes, porosity, hard spots, shrinkage defects, cracks, and other injurious defects. Defects in casings shall not be repaired, except when such work is approved and is done by or under the supervision of the pump manufacturer, and then only when the defects are small and do not adversely affect the strength or use of the casing. Casings shall be single or double volute with flanged piping connections conforming to ASME B16.1, Class 125. The direction of shaft rotation shall be conspicuously indicated. The casing shall have tapped openings for air venting, priming, draining, and suction and discharge gauges. A brass or bronze umbrella or vent cock shall be furnished for venting, except where automatic air vents are indicated. Drain openings in the volute, intake, or other passages capable of retaining trapped water shall be located in the low point of such passages.

2.2.6 Impellers

Impellers shall be of enclosed design and shall be constructed of steel or Noryl, carefully finished with smooth water passageways, and shall be statically and dynamically balanced. Impellers shall be securely keyed to the pump shaft.

2.2.7 Shaft

Shaft shall be of high-grade steel, accurately machined, and shall be of sufficient size and strength to perform the work required. Vertical shafts shall be the closed type and shall be adequately provided with alignment bearings. Bronze renewable shaft sleeves shall be provided for protection of the shaft in contact with water, and in the stuffing boxes. Shaft sleeves shall be keyed to the pump shaft.

2.2.9 Packing Seals

Packing shall be non-asbestos. Pump shall be shipped to the site without the packing inserted and shall be packed on the site in the presence of the pump or packing manufacturer's representative. At no time during start-up or run-in shall the gland drip less water than 80 drops per minute. After not less than 40 operating hours and upon permission of the Contracting Officer, leakage rate may be reduced to 50 drops per minute or to the rate recommended by packing manufacturer.

2.2.9.1 Gland

Gland shall be split-bronze type with ASTM F593 stainless steel eyebolts and pins or studs. Hex-nuts shall be bronze or nongalling stainless steel.

2.2.9.2 Stuffing boxes

Stuffing boxes exposed to below atmospheric pressure at any operating condition, including starting, shall be provided with a water seal. Water seal shall consist of nonferrous lantern ring or a seal cage and required connections to the pump case.

2.2.10 Mechanical Seals

Mechanical seals shall be balanced or unbalanced, as necessary to conform to specified service requirements. Mechanical seals shall be constructed in a manner and of materials particularly suitable for the temperature service range and quality of water being pumped. Seal construction shall not require external source cooling for pumped-fluid service temperatures up to 250 degrees Fahrenheit (°F). Seal pressure rating shall be suitable for maximum system hydraulic conditions. Materials of construction shall include AIST PB-229 series stainless steel, solid tungsten-carbide rotating-seal face, and

Buna-N vinylidene-fluoride-hexafluoropropylene, EPT, or tetrafluoroethylene seals. Bypass flushing water supply shall be free of iron rust products and other abrasive materials, and shall be directed onto the face of the seal without dead-ending. All piping and accessories shall be provided. Throttling bushing shall have clearances to minimize leakage in case of complete seal failure without restriction of flushing water. Mechanical seals shall not be subjected to hydrostatic test pressures in excess of the manufacturer's recommendations.

2.2.11 Couplings

Couplings shall be of the heavy-duty flexible type, keyed and locked to the shaft. The outside surface of the couplings for horizontal pumps and close-coupled vertical pumps shall be machined parallel to the axis of the shaft. The faces of the couplings shall be machined perpendicular to the axis of the shaft. Disconnecting the couplings shall be accomplished without removing the driver half or the pump half of the couplings from the shaft. Couplings for vertical pumps other than close-coupled vertical pumps may be of the universal type. Flexible couplings shall not be used to compensate for misalignment of pump.

2.2.12 Balance

All rotating parts of the equipment shall operate throughout the required range without excessive end thrust, vibration, or noise. Defects of this type that cannot be eliminated by installation adjustments will be sufficient cause for rejection of the equipment. Pump impeller assemblies shall be statically and dynamically balanced to within 1/2 percent of W times R squared, where W equals weight and R equals impeller radius. Shaft construction shall be substantial to prevent seal or bearing failure due to vibration. Total shaft peak-to-peak dynamic deflection measured by vibrometer at pump-seal face shall not exceed 2.0 mils under shutoff-head operating conditions. Flow from ¼-inch iron pipe size (ips) pipe shall be provided during testing.

2.2.13 Bearings

Bearings shall be ball or roller type, and the main bearings shall take all radial and end thrust. Pumps that depend only on hydraulic balance to overcome end thrust will not be acceptable.

2.2.14 Cocks, Plugs, and Accessories

The pumps shall be equipped with drain plugs.

2.2.17 Piping Connections

The pump suction and discharge shall be provided with threaded or flanged connections of suitable size and suitably arranged for piping shown. Pipe flanges shall conform to ASME B16.1 and ASME B16.5. Piping shall be installed to preclude the formation of air pockets.

2.2.18 Finish

Pump shall have painted or enameled finish as is standard with the manufacturer, except that fire pumps shall be red in color.

Approved products: P-101 – P-110 Gould Irrigator GT-107 or equivalent
P-201 Gould

2.3 ELECTRICAL WORK

Each motor shall be of sufficient capacity to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor when operating at proper electrical system voltage and frequency. Manual or automatic control and protective or signal devices required for the operation herein specified and any control wiring required for controls and devices but not shown on electrical plans shall be provided under this section of the specifications.

2.4 ELECTRICAL EQUIPMENT

Motor controls, equipment, and wiring shall be in accordance with NFPA 70.

2.4.1 Electric Motors

Each electric motor-driven pump shall be driven by a weather protected, Type II continuous-duty electric motor. Motor shall have a 1.1 service factor. Motors shall be squirrel-cage induction motors having normal-starting-torque and low-starting-current characteristics, and shall be of sufficient size so that the nameplate horsepower rating will not be exceeded throughout the entire published pump characteristic curve. Integral size motors shall be the premium efficiency type in accordance with NEMA MG 1. Motor bearings shall provide smooth operations under the conditions encountered for the life of the motor. Motors shall be rated 2408 volts, 1 phase, 60 Hz (P-101 – P-110), and 480 volts, 3 phase, 60 Hz (P-201 and P-202) and such rating shall be stamped on the nameplate.

2.4.2 Control Equipment

Automatically controlled pumps shall have three-position "HAND – OFF- AUTO" selector switch in cover. Additional controls or protective devices shall be as indicated. A pump low-water cutoff shall be installed in the well and shall shut the pump off when the water level in the well reaches the level shown.

2.4.3 Variable Speed Controls

The variable speed motor controller (P-101 – P-110) shall convert 240 volt plus 15 percent, minus 5 percent, three phase, 60 Hz (plus or minus 2 Hz) utility power to adjustable voltage/frequency, single phase, ac power for stepless motor control from 5 to 105 percent of base speed. P-201 VFD shall convert 480 VAC in accordance with the above.

2.4.3.1 Description

The variable speed drive shall produce an adjustable ac voltage/frequency output for complete motor speed control. The variable speed drive shall be both manually automatically controlled. The variable speed drive shall be self-contained, totally enclosed in a NEMA MG 1 ventilated cabinet, and capable of operation between 32 and 104°F. The variable speed drive maximum output current rating shall be equal to or exceed the motor nameplate full load. The manufacturer shall advise the maximum recommended motor sine wave current for each controller rating. Variable speed drive multiple motor operation at same frequency/speed shall be possible as long as the sum of connected motor full load sine wave currents are less than or equal to the variable speed drive maximum continuous current rating. Variable speed drive shall be 95 percent efficient at 100 percent rated output power, 60 Hz.

2.4.3.2 Governing Requirements

Variable speed drives shall conform to the following requirements:

a. Variable speed drive shall comply with 47 CFR 15 regulation of RF1/EM1 emission limits for Class A computing devices. The FCC label of compliance shall be displayed on the variable speed drive.

b. The variable speed drive and options shall comply with the applicable requirements and the standards of the American National Standards Institute (ANSI).

c. Variable speed drive and option design and construction thereof shall comply with all applicable provisions of NFPA 70, Article 43D, Sections A-L.

2.4.3.3 Quality Assurance

To ensure quality, the variable speed drive shall be subject to the following tests:

a. The integrated circuits shall undergo a 160-hour "burn-in" to test reliability. During the "burn-in," the temperature shall be cycled between 32 and 158°F.

b. The completed unit shall undergo a fully loaded 24-hour "burn-in."

c. The unit shall be subject to a series of in-plant quality controlled inspections before approval for shipment from manufacturer's facilities.

2.4.3.4 Service

The variable speed drive shall be supplied with the following:

a. One-year parts and labor warranty.

b. A troubleshooting guide to help the building operator determine what steps must be taken to correct any problem that may exist in the system.

2.4.3.5 Basic Features

The variable speed drive shall have the following basic features:

a. Hand/Off/Auto Operation.

b. Manual/Auto speed reference switch.

c. Minimum/maximum adjustable speeds.

d. Speed potentiometer.

e. Auto restart.

f. Linear timed acceleration and deceleration for soft starting/stopping.

g. 3-63 Hz controlled speed range. (Factory set at 15 Hz minimum).

h. Terminal connections for time clock control, fire, smoke, freeze detectors, and EP relay pre-set speed override.

i. Output frequency terminals for remote metering.

2.4.3.6 Protective Circuits and Features

The variable speed drive controller shall include the following protective circuits/features:

a. Current limits to 100 percent design by slowing down motor.

b. Instantaneous Electronic Trip - automatically shut down motor if current exceeds 120 percent of design or phase-to-phase output short circuit occurs.

c. The variable speed drive will restart automatically when input line returns to normal in the event of intermittent power outage or phase loss or overvoltage shutdown.

d. Input power protection shuts down the unit if the following faults occur: low input line voltage; or loss of an input phase.

e. Insensitive to incoming power phase.

f. Fast-acting current limiting input fuses, (Class J) rated with 200,000 interrupting amperes capability.

g. Isolated 115 volt control circuit and dedicated control transformer.

h. Line-to-line fault protection.

i. Line-to-ground short circuiting and accidental motor grounding protection.

j. Output thermal overload relay trip.

2.4.3.7 Adjustments

The variable speed drive has the following adjustments available via potentiometers located on the faceplate of a single regulator printed circuit board:

a. Minimum speed: 0-75 percent.

b. Maximum speed: 100 percent.

2.5 MINI DIAPHRAGM PUMP

The pumps shall be mini-diaphragm pumps, plastic bodied and 120 VAC power.

	Pump No.
	P-301 – P-305

2.5.1 Pump Service

The pumps shall be utilized for the following service:

	Pump No.
Soil vapor extraction	
Water condensate	P-301 – P-305

2.5.2 Pump Drives

The pumps shall have electric drive motors for the positive displacement mini diaphragm pumps. Pumps will be run on a timer K-301

2.5.3 Pump Construction

Pump construction shall be polypropylene, with PTFE or santoprene diaphragms, ½-inch tubing inlet and outlet.

2.5.4 Pump Characteristics

The pumps shall be capable of discharging quantities at total discharge heads measured at the discharge flange:

Pump No.	gpm at total discharge head, ft. H(2)O	T, max degrees
P-301 – P-305	3.5 gpm, 20 ft H(2)O	110

Suction lift: 8-9 ft

2.2.5 Pump Casings

All Pump casings shall be polypropylene or similar.

Approved product: Flojet electric diaphragm pump

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect/Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 INSTALLATION

A. General: Preparation and installation shall be in accordance with reviewed product data, final shop drawings, manufacturer's written recommendations, and as indicated on the drawings.

1. Equipment shall be installed in accordance with final submittals and the Contract Documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

2. Equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove dirt and construction debris prior to initial operation and final testing of the system.

3.3 FIELD QUALITY CONTROL

A. On-site acceptance test shall be as follows:

1. The complete installation shall be tested for compliance with this Section following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by the Contractor. The Owner shall be notified in advance and shall have the option to witness the tests.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 15662

PROCESS CHILLERS

PART 1 – GENERAL

1.01 SUMMARY

An approximately 2,000,000 BTU/hr water chiller mounted on a portable enclosure will be used to cool up to 60 gallons per minute (gpm) of treated groundwater from approximately 100 degrees Fahrenheit (F) to 60 degrees F for injection into the subsurface of the Skykomish School (the School) in Skykomish, Washington. The enclosure shall protect the chiller from environmental conditions that may range up to 80 pounds per square foot (psf) of snow. The chiller will not be required to operate in freezing temperatures, but provisions to drain all water must be provided.

The portable enclosure may be a semi-trailer van up to 45 feet (ft) long or an 8-ft by 20-ft or 40-ft shipping container.

1.02 PROJECT CONDITIONS

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish a modular chiller unit.

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330:

1. Submit material, equipment, and fixture lists for chiller systems, including manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, fabrication site information, and technical product data/sizing calculations.
2. Submit installation instructions and operations and maintenance manual (two copies).
3. Submit shop drawings of connection diagrams indicating the physical layout of all controls, internal tubing and wiring diagrams, and the relations and connections of water-chiller, compressor, condenser, control and control panels, cooler, insulation, motors, purge system, spare parts, and special tools.
4. Submit equipment foundation data, including equipment weight and operating loads, location and projection of anchor bolts, and horizontal and vertical clearances for installation, operation, and maintenance. Also include dimensions of foundations and relative elevations, and installation requirements such as noise abatement, vibration isolation, physical features, dimensions, ratings, equipment weights, and utility services. Include foundation data for the following:
    a. Water Chiller
    b. Compressor
    c. Condenser
    d. Cooler

e. Purge System

f. Motors

5. Submit control diagrams for chiller units showing the physical and functional relationship of equipment. Show on electrical diagrams the size, type, and capacity of the system.

1.03 QUALITY ASSURANCE

A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants.

B. After installation of equipment, the engineer or technician shall submit a signed certificate or certified written statement that the equipment is installed in accordance with the manufacturer's recommendations.

C. References listed below form a part of this specification to the extent referenced:

1. AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

a. AHRI 480 (2007) Refrigerant-Cooled Liquid Coolers, Remote Type

b. AHRI 550/590 I-P (2011) Performance Rating Of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle

c. ANSI/AHRI 520 (2004) Performance Rating of Positive Displacement Condensing Units

2. American Society of Mechanical Engineers (ASME) International

a. ASME BPVC SEC VIII D1 (2010) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1

3. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

a. NEMA MG 1 (2011; Errata 2012) Motors and Generators

PART 2 – PRODUCTS

2.01 WATER CHILLER AND RELATED EQUIPMENT

A. Water Chiller Package

Ensure water chiller assembly is packaged and self-contained and includes compressor-condenser, cooler (refrigerant evaporator) accessories, control panel, and intercomponent piping and wiring ready for field terminal connections.

Provide unit and spare parts conforming to the applicable requirements of AHRI 550/590 I-P, AHRI 480, and specified requirements. Ensure Energy Efficiency Ratings (EER) meet or exceeds the full-load efficiency and the integrated part-load value (IPLV) efficiency ratings as described in AHRI 550/590 I-P.

B. Compressor

Provide direct-driven scroll-type compressor with hermetically sealed compressor motor assembly. Provide with refrigerant motor windings. Ensure rotor assembly is statically and dynamically balanced.

Provide a forced-feed type compressor lubrication system with oil sump, hermetically sealed motor-driven positive displacement pump, oil filter, and strainer, with oil temperature thermostatically controlled. Provide a mechanically operated oil supply to the bearings during spin down in event of power interruption. Include interlocked differential oil-pressure cutout with starting equipment, which allows the compressor to operate only when the required oil pressure is available at the bearings.

Provide compressor with temperature-actuated capacity reduction. Provide automatic capacity regulation from 100 percent to 10 percent of capacity. Provide automatic hot-gas bypass if required to maintain stable operation, with the control system including automatic stopping when load falls below 10 percent capacity point, and automatic unloaded restarting on load demand. Ensure capacity modulation is controlled by the temperature of the water leaving the cooler, with unit controller capable of maintaining leaving-water temperature at plus or minus 1.0 degree F of the set point.

C. Condenser

Provide shell-and-tube cleanable-type condenser, complying with ASME BPVC SEC VIII D1 regarding quality of materials used, methods of construction, design of components, and testing of materials, assemblies, connections, and appurtenances. Ensure minimum water-side working pressure is 150 pounds per square inch (psig). Minimum refrigerant-side working pressure is saturation pressure of refrigerant used at 85 degrees F. Pneumatically test spaces not subject to ASME code due to size or other limitations at 1-1/2 times working pressure or 45 psig, whichever is greater.

Provide seamless copper tubing with integral fins, individually removable from either end of shell, rolled or brazed into tube sheet. Provide intermediate tube supports so that distance between supports does not exceed approximately 3 feet. Fit supports to the tubes in a manner that preclude corrosion, vibration, and abrasion.

Fit and arrange water boxes or removable elbows to permit cleaning of tubes without disturbing piping beyond elbows, with flanged or grooved coupling type elbows and hinge mounted end bells.

Design the unit to permit pump-down and isolation of the entire refrigerant charge within 80 percent of available condenser volume. If the unit condenser does not have sufficient pump-down capacity, provide a separate pump-out tank.

Base the condenser performance on a maximum water velocity of 10 feet per second (fps) and a fouling factor of 0.001. Ensure design and construction provisions preclude tube failure due to erosion.

Base the condenser performance on a maximum water velocity of 7 fps and a fouling factor of 0.001.

D. Cooler (Refrigerant Evaporator)

Provide cooler conforming to the requirements specified in the above paragraph "Condenser" and to the following:

Base the cooler capacity on refrigerant suction temperature in excess of 32 degrees F and a fouling factor of 0.0005.

Provide a frangible safety relief device. Device to be piped to enclosure roof.

E. Purge System

When a positive-pressure refrigerant is used by the manufacturer in the basic liquid chiller unit, a purge system is not required.

Ensure when in operation, the purge system functions automatically to remove air, water vapor, and noncondensable gases from the refrigeration system and condenses, separates, and returns any refrigerant present therein to the system. Ensure purge system manually or automatically starts and stops and is assembled as a compact unit. Verify purge system is complete with operating and safety devices, with an oil separator if recommended by the manufacturer. Ensure units purge no more than 0.1 pounds of noncondensable gas.

F. Control and Control Panels

Provide water-chilling unit with one control panel containing safety and operating devices and intercomponent piping and wiring for field terminal connection and fully automatic operation.

Coordinate the controls with automatic temperature control systems and electrical work specified and indicated. Provide control panel containing control equipment specified, and control equipment normally furnished and recommended by the manufacturer for optimum operation of the system. Permanently identify control panel items, including at least the following:

1. Refrigerant suction and discharge pressure gages.
2. Oil-pressure gages.
3. Purge-drum pressure gage.
4. Refrigerant low-temperature or low-pressure cutout.
5. Refrigerant high-pressure cutout.
6. Time delay relays.
7. Motor high-temperature cutout.
8. Lubricating-oil high-temperature cutout if required by equipment.
9. Oil differential-pressure interlock.
10. Interlock relays and reset button.
11. Manual/automatic selector switches and controls for purge pumps.
12. Pilot lights indicating position of safety controls.
13. System start/stop provisions with condition-indicating lights.

14. Load-limiting device to operate capacity-control mechanism.
15. Cooler refrigerant thermometer with well.
16. Main circuit protective and interruptive device.
17. Transformers for any other source-voltage requirements.
18. Terminals for field-installed equipment.
19. Motor controllers.

Provide the following items as part of the installation:

1. Alarm contacts for remote sensing of alarm conditions.
2. Chilled-water and condenser supply-and-return thermometers with wells.
3. Indicating-type chilled-water thermostat with well.
4. Chilled-water low-temperature cutout.

G. Motors

Provide hermetically sealed motors conforming to NEMA MG 1, ANSI/AHRI 520 and requirements for motors as specified herein.

Provide motors with permanently lubricated, rolling element type bearings.

If water-chiller unit or any component could be damaged by reverse motor operation, and when proposed water-chiller unit contains a mechanically driven lubricating-oil pump, the manufacturer's responsibility includes:

1. Providing reverse-phase rotation protection, if motor controllers are provided as part of package.
2. Indicating in shop drawings that reverse-phase rotation protection is necessary if motor controllers are in a motor-control center not provided by the manufacturer.

H. Insulation

Insulate and vapor seal cooler shell and suction piping between evaporator and first stage of each compressor unit. Insulate the water boxes, allowing for ease of access to heads for inspection and repair. Where motors are the gas-cooled type, provide insulation and vapor seal on the cold-gas inlet connection to the motor.

Provide manufacturer's standard color elastomeric unicellular foam vapor seal material of 1 inch minimum thickness to preclude condensation of ambient moisture on any surface under site-operating conditions. If unicellular material is black or is otherwise coated, only use polyvinylchloride lacquer for coating. Remove and replace any coating that cracks when unicellular material is compressed with specified coating at no additional expense.

PART 3 – EXECUTION

3.01 INSTALLATION

Install equipment as specified and in accordance with manufacturer's installation drawings and written instructions, including ratings and service requirements.

A. Alignment

Before attempting alignment, demonstrate that the pump does not have any load/force imposed by the piping system. Minimum alignment values (below) are for pump and driver at normal running temperatures. Ensure values are compensated for thermal growth. Ensure limited movement of the pump or driver (commonly known as bolt-bound) is corrected to ensure alignment capability. Do not undercut hold down bolts in order to perform adjustment.

Provide commercially die-cut shims, without seams or folds, made of corrosion resistant stainless steel. Use no more than four shims at any single point.

Provide installed alignment jack bolts on all units with a drive motor over 25 hp.

Provide pump and driver with an intermediate shaft, spacer, or spool piece (sometimes called a jackshaft). Based on the motor nominal operating speed, align the pump and driver to the following minimum specifications:

Speed (RPM)	Close-Coupled Offset (mils)	Close-Coupled Angle (mils/in)	Spool Piece Angle @ Coupling Point
600	6.0	2.0	3.0
900	5.0	1.5	2.0
1200	4.0	1.0	1.5
1800	3.0	0.5	1.0
3600	1.5	0.4	0.5

Perform pump alignment under the direction of the manufacturer's representative.

Provide final alignment settings as part of the final test data.

3.02 QUALITY CONTROL

A. Inspection and Testing

Completely charge unit(s) with refrigerant and oil before operation.

Prior to final acceptance, verify pump and motor conformance to specifications using vibration analysis, with vibration levels not exceeding .075 in/sec at 1 times run speed and at pump frequency, and .04 in/sec at other multiples of run speed.

Use a Fast Fourier Transformer (FFT) analyzer to measure vibration levels, having the following characteristics:

1. Dynamic range greater than 70 dB.
2. A minimum line resolution of 400.
3. A frequency response range of 5 Hz-10 KHz.
4. The capacity to perform ensemble averaging.
5. The capability to use a Hanning window.
6. Auto ranging frequency amplitude.
7. A minimum amplitude accuracy over the selected frequency range of plus or minus 20 percent or plus or minus 1.5 dB.
8. An accelerometer, either stud-mounted or mounted using a rare earth low mass magnet and sound disk (or finished surface) used with the FFT analyzer to collect data.

Ensure the mass of the accelerometer and its mounting have minimal influence on the frequency response of the system over the selected measurement range.

Upon completion of the installation, and within 60 calendar days after the date of initial operation, conduct performance tests in the presence of the Engineer. Conduct these tests until the performance of the system is proven, with 8 hours of successful operation as a minimum period. Correct any equipment defects or performance deficiencies, and repeat the tests until performance is fully accepted by the Engineer. Determine the water flows from the pressure-drop across chiller and condenser, and from pump curves. Provide calibrated test instruments.

Ensure each unit is tested for leaks under pressure and evacuated and dehydrated to 35 degrees F wet bulb, or an absolute pressure of not over 0.24 inch of mercury.

Provide final test reports to the Engineer. Provide reports with a cover letter/sheet clearly marked with the system name, date, and the words “Final Test Reports - Forward to the Engineer for inclusion in the Maintenance Database.”

B. Manufacturer’s Representative

Provide the services of a competent factory-trained representative to supervise the assembly, charging, testing, and startup of equipment. Provide documentation that a factory performance test has been conducted on every chiller in accordance with AHRI 550/590 I-P, witnessed by the Contractor.

3.03 CLOSEOUT ACTIVITIES

Provide one complete set of special tools, as recommended by the manufacturer, for field maintenance of the system, in a locked toolbox. Provide two keys to the Contractor.

Make provisions for Contractor personnel to receive 8 hours of instructions in proper operation and maintenance procedures.

Submit two copies of the operation and maintenance manual 30 calendar days prior to testing the chiller system. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.

Submit record drawings for centrifugal chiller units providing current factual information, including deviations from, and amendments to, the drawings and concealed and visible changes in the work.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 15710

AIR TO AIR HEAT EXCHANGER

PART 1 – GENERAL

1.01 SUMMARY

A. This specification covers the minimum requirements to which the air to air heat exchanger HTX-301 (see P-108) is designed, fabricated, and tested. This unit is designed to transfer heat between ambient air and the extracted soil vapor.

1.02 PROJECT CONDITIONS

B. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish an air to air heat exchanger for treatment of SVE offgas.

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330:

1. Manufacturer's specifications.
2. Technical product data.
3. Installation instructions.

B. Contractor shall submit any proposed deviations from the Specifications.

1.03 QUALITY ASSURANCE

A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants.

B. References listed below form a part of this specification to the extent referenced:

1. AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)
   a. ABMA 11 (1990; R 2008) Load Ratings and Fatigue Life for Roller Bearings
   b. ABMA 9 (1990; ERTA 2012; S 2013) Load Ratings and Fatigue Life for Ball Bearings
2. American Society of Mechanical Engineers (ASME) International
   a. ASME B16.1 (2010) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
3. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
   a. NEMA ICS 1 (2000; R 2008; E 2010) Standard for Industrial Control and Systems: General Requirements
   b. NEMA ICS 6 (1993; R 2011) Enclosures

c. NEMA MG 1 (2011; Errata 2012) Motors and Generators

4. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

a. NFPA 70 (2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code

PART 2 – PRODUCTS

2.01. AIR TO AIR HEAT EXCHANGER

A. Design Requirements

Capacity and design of the air moving equipment and accessories shall be suitable for 24-hour full load service in an outdoor location, and shall meet the following criteria.

Design Life	
Minimum	10 years
Altitude (above MSL)	
Minimum	900 ft
Hot Side Air Performance Spec for Cooling, 500 cfm	
Temperature In	120 degrees Fahrenheit
Temperature Out	95 degrees Fahrenheit
Ambient Air Cold Side	
Temperature In	70 degrees Fahrenheit

B. Service Conditions

Service vapor collected from petroleum release. Anticipated contaminant concentration in the vapor is:

Total Petroleum Hydrocarbons as Gasoline	100 ppm Maximum
	87 ppm Average
	0 ppm Minimum

C. Nameplate

Each piece of equipment shall have a standard nameplate securely affixed in a conspicuous place showing the manufacturer's name and address and the type or style, model, serial number, and catalog number. Nameplate for each electrical motor shall show, at least, the minimum information required by paragraph 10.38 of NEMA MG 1. Any other information that the manufacturer may consider necessary to complete identification shall be shown on the nameplate.

Approved products: Xchanger, Inc. Model AA-1000

PART 3 – EXECUTION

3.01 AIR TO AIR HEAT EXCHANGER

A. Install equipment as shown and in accordance with written instructions of the manufacturer. Unit shall be installed in the vertical position, with horizontal air flow.

3.02 QUALITY CONTROL

A. Field test data of operation shall be recorded and documented in a formal field test report.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 15715

AIR TO WATER HEAT EXCHANGER

PART 1 – GENERAL

1.01 SUMMARY

A. This specification covers the minimum requirements to which the air to water heat exchanger HTX-101 (see P-105) is designed, fabricated, and tested. This unit is designed to transfer heat between extracted groundwater and ambient air.

1.02 PROJECT CONDITIONS

B. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish an air to air heat exchanger for treatment of soil vapor extraction offgas.

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330:

1. Manufacturer's specifications.
2. Technical product data/sizing calculation.
3. Installation instructions.

B. Contractor shall submit any proposed deviations from the Specifications.

1.03 QUALITY ASSURANCE

A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants.

B. References listed below form a part of this specification to the extent referenced:

1. AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)
   a. ABMA 11 (1990; R 2008) Load Ratings and Fatigue Life for Roller Bearings
   b. ABMA 9 (1990; ERTA 2012; S 2013) Load Ratings and Fatigue Life for Ball Bearings
2. American Society of Mechanical Engineers (ASME) International
   a. ASME B16.1 (2010) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
3. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
   a. NEMA ICS 1 (2000; R 2008; E 2010) Standard for Industrial Control and Systems: General Requirements
   b. NEMA ICS 6 (1993; R 2011) Enclosures

c. NEMA MG 1 (2011; Errata 2012) Motors and Generators

4. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

a. NFPA 70 (2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3 2014) National Electrical Code

PART 2 – PRODUCTS

2.01 AIR TO WATER HEAT EXCHANGER

A. Design Requirements

Capacity and design of the air to water heat exchanger equipment and accessories shall be suitable for 24-hour full load service in an outdoor location, and shall meet the following criteria:

Design Life	
Minimum	10 years
Altitude (above MSL)	
Minimum	900 ft
Hot Side Water Performance Spec for Cooling: 60 gpm	
Temperature In	130 degrees Fahrenheit
Temperature Out	85 degrees Fahrenheit
Ambient Air Cold Side	
Temperature In	70 degrees Fahrenheit

B. Service Conditions

Groundwater for cooling is from petroleum release. Anticipated contaminant concentration in the groundwater is:

Total Petroleum Hydrocarbons as Gasoline	1 mg/L Maximum
	0.5 mg/L Average
	0 mg/L Minimum

C. Nameplate

Each piece of equipment shall have a standard nameplate securely affixed in a conspicuous place showing the manufacturer's name and address and the type or style,

model, serial number, and catalog number. Nameplate for each electrical motor shall show, at least, the minimum information required by paragraph 10.38 of NEMA MG 1. Any other information that the manufacturer may consider necessary to complete identification shall be shown on the nameplate.

Approved product: Xchanger, Inc. Model LC-48-1

PART 3 – EXECUTION

3.01 AIR TO WATER HEAT EXCHANGER

A. Install equipment as shown and in accordance with written instructions of the manufacturer. Unit shall be installed in the vertical position, with horizontal air flow.

3.02 QUALITY CONTROL

A. Field test data of operation shall be recorded and documented in a formal field test report.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 15830

BLOWERS (SOIL VAPOR EXTRACTION)

PART 1 – GENERAL

1.01 SUMMARY

Provide a soil vapor extraction (SVE) centrifugal blower capable of 100 to 800 standard cubic feet per minute (scfm) at an average vacuum of approximately 2 inches of mercury (inHg). Average flow rate is approximately 500 scfm. A variable frequency drive will be used to control the blower, along with intake throttling. An air-to-air heat exchanger shall be provided on the blower inlet with sufficient capacity to reduce the air temperature 25 degrees F (see Section 15710). Provide a moisture separator to remove moisture prior to the blower. The moisture separator will be equipped with a dedicated pump-out system. The units will be installed in the SVE/Equipment Enclosure. Units will be installed at the fabricator's shop as part of the SVE/Equipment Enclosure fabrication (see Section 11200).

1.02 PROJECT CONDITIONS

A. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish the SVE blower and moisture separator.

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330:

1. Product data, including blower curve, instrumentation, noise level, and expected temperature rise.
2. Operations and maintenance manual (two copies).
3. Shop drawings of the units.

1.03 QUALITY ASSURANCE

A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants.

B. After installation of equipment, the engineer or technician shall submit a signed certificate or certified written statement that the equipment is installed in accordance with the manufacturer's recommendations. Blower should be tested at the fabricator of the SVE/Equipment Enclosure.

C. References listed below form a part of this specification to the extent referenced:

1. AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
    a. AMCA 210 (2007) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

2. AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

   a. ACGIH-2097 (2013) Industrial Ventilation: A Manual of Recommended Practice for Design

3. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

   a. NEMA ICS 1 (2000; R 2008; E 2010) Standard for Industrial Control and Systems: General Requirements

   b. NEMA ICS 6 (1993; R 2011) Enclosures

   c. NEMA MG 1 (2011; Errata 2012) Motors and Generators

PART 2 – PRODUCTS

2.01 SVE BLOWER

A. Design Requirements

Capacity and design of the air moving equipment and accessories shall be suitable for 24-hour full load service in an indoor location, and shall meet the following criteria:

Blower Capacity (Vacuum Operation)	
Range	300 cfm @150 IWC to 800 cfm @ 50 IWC; adjustable below this curve using variable speed drive
Altitude (above MSL)	
Minimum	900 ft
Ambient Air Temperature	
Maximum	120 degrees Fahrenheit (F)
Minimum	50 degrees F
Air Relative Humidity	
Maximum	100 percent
Minimum	50 percent

B. Service Conditions

Blower and moisture separator will be located indoors in the SVE/Equipment Enclosure.

Approximate SVE vapor composition is as follows:

Total Petroleum Hydrocarbons as Gasoline	100 ppm Maximum
	87 ppm Average
	0 ppm Minimum

C. Control System

Unit shall have an automatic control system consisting of interlocks for blower shutdown, including moisture separator high level, high back Pressure, and temperature. Blower adjustment for flow and vacuum will consist of intake throttle valves and a variable frequency drive.

A NEMA 4 control panel enclosing relays, contactors, timers, and selector switches shall be wall mounted with vibration isolators on the unit, and provided with hinged cover and latch. Instruments shall be of the direct reading type and shall be factory mounted and connected. Shutdown feature shall be connected to the annunciator on the instrument panel and each shutdown feature shall be identified. Panel shall include the following features and instruments:

1. Running time meter.
2. Alarm annunciator with contacts to operate a remote alarm, and individual lights for each alarm condition.
3. Hand-Off-Auto switch for operation.

D. Approved Units

Airtech 3BA1900 regenerative or similar, with variable speed drive.

2.02 MOISTURE SEPARATOR

A. Design Requirements

Moisture separator shall be designed, fitted, and rated for 25 psi working pressure, and 100 to 800 cfm of air flow. Each receiver shall have a storage capacity not less than 50 gal. Each receiver shall be equipped with inlet and outlet drop pipe, level controls with automatic pump out and a high-high level alarm float switch, The outside of liquid receivers shall be galvanized or supplied with commercial enamel finish.

B. Automatic Pump Down

Moisture separator shall be equipped with an automatic pump down system on integrated level controls. Suction shall exceed approximate 2 inHg. Performance shall be 20 gallons per minute @50 ft total dynamic head.

2.03 VARIABLE FREQUENCY MOTOR DRIVE

A. Design Requirements

The variable speed drive shall produce an adjustable AC voltage/frequency output for complete motor speed control. The variable speed drive shall be manually controlled by a speed-control potentiometer on the front panel, and in auto mode, shall be shut off by local temperature and back pressure alarms and a general system fault shutdown signal from the PLC (electronic signal). The variable speed drive shall be self-contained, totally enclosed in a NEMA MG 1 ventilated cabinet, and capable of operation between 32 and 104 degrees F. The variable speed drive maximum output current rating shall be equal to or exceed the motor nameplate full load. The manufacturer shall advise the maximum recommended motor sine wave current for each controller rating. Variable speed drive multiple motor operation at same frequency/speed shall be possible as long as the sum of connected motor full load sine wave currents are less than or equal to the variable speed drive maximum continuous current rating. Variable speed drive shall be at least 85 percent efficient at 100 percent of rated output power.

B. Basic Features

The variable speed drive shall have the following basic features:

1. Hand-Off-Auto operation.
2. Manual/auto speed reference switch.
3. Minimum/maximum adjustable speeds.
4. Speed potentiometer.
5. Auto restart.
6. Linear timed acceleration and deceleration for soft starting and stopping.
7. Controlled speed range 3-63 Hz. (Factory set at 15 Hz minimum.)
8. Terminal connections for time clock control; fire, smoke, and freeze detectors; and EP relay pre-set speed override.
9. Output frequency terminals for remote metering.

PART 3 – EXECUTION

3.01 INSTALLATION

Vibration dampener(s) shall be installed in to isolate each unit from the structural base on which the unit is installed. Each air moving unit and motor shall be installed, aligned, and leveled in accordance with the written instruction of the manufacturer. Flexible couplings shall not be used to compensate for misalignment between driver and driven unit.

3.02 QUALITY CONTROL

A. Inspection and Testing

Units shall be tested prior to leaving the fabricator responsible for assembling the SVE/Equipment Enclosure module.

3.03 CLOSEOUT ACTIVITIES

Submit two copies of the Operation and Maintenance manuals, and submit record drawings for products.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 15950

FUEL SYSTEM LEAK TESTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Leak Testing of existing fuel oil system.

1.02 RELATED REQUIREMENTS

A. See Division 1 for related requirements.

1.03 SUBMITTALS

A. See Section 01330 for submittal procedures.

B. Qualifications: Submit name of testing agency/firm for approval within 30 days after award of Contract.

C. Reports.

1. Submit in writing firms' standard report documenting results of tightness/leak testing.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Company specializing in leak testing of below grade fuel tanks with a minimum of 5 years of documented experience.

B. Work shall be performed by Northwest Tank and Environmental Services, Inc (509-255-6705) or approved equal.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL BACKGROUND

A. The school has an existing below grade fuel oil tank that stores fuel for the building's steam boiler. Below grade fuel oil supply and return piping transports fuel between the tank and the existing boiler. The fuel piping is routed completely below grade and stubs up in the boiler room adjacent to the boiler. In addition, there is a fuel tank vent routed below grade between the tank and the school building where it is routed to above grade up a wall and terminates with a vent. The exact size of the tank is not known (may be approximately 5,000 gallons). The configuration and type of piping used and the type of tank used is unknown (likely metal). At this time it is not known if any of the piping or the tank are leaking.

3.02 GENERAL REQUIREMENTS

A. Perform tank and pipe tightness testing per industry recognized standards and in accordance with EPA regulations CFR 40 Part 280.43. The following shall be tested.

1. Entire below grade fuel system composed of vent piping, tank, fuel supply/return piping and other accessories. Intent is to verify tightness of any parts of existing system that could result in leakage of fuel below grade.

B. Contractor is responsible for verify existing conditions in order to understand what is required to perform required testing. Scope of work shall include whatever steps are required to allow for proper testing. For example, this could include installing temporary isolation valves, caps or plugs as required to allow isolation of fuel/vent piping and fuel tank to allow tightness testing.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 16050

BASIC ELECTRICAL MATERIALS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Summary
B. Submittals
C. Conduit
D. Miscellaneous Electrical Equipment
E. Conduit Installation
F. Protection
G. Workmanship

1.02 SUMMARY

A. This Section specifies the basic materials for electrical installations.

B. The Work included in this Section consists of furnishing all labor, materials, and all appurtenant Work in connection with basic installation of electrical conduit specified in Plans and herein.

1.03 SUBMITTALS

A. Panel wiring and layout Plans must be submitted in triplicate for Engineer's approval, prior to delivery to the site. Engineer is to be provided at least two weeks to review and comment on Plans without impacting schedule.

B. All manufacturers' certifications, Plans, and manuals must be submitted prior to installation of any electrical equipment.

C. Upon completion of the Work, submit complete as-built Drawing(s) for all electrical panels, interconnections, and layout diagrams.

PART 2 – PRODUCTS

2.01 CONDUIT

A. Each length of conduit shall bear the UL label and be rated for the wire size with a minimum size of 3/4 inch, unless noted otherwise. Elbows shall be standard radius sweeps meeting the requirements of the National Electrical Code (NEC).

B. Buried, Submerged, and Exposed Locations:

1. Rigid galvanized steel conduit shall be used in all locations.
2. Conduit shall be Schedule 40 full weight, pipe size, finished inside and out by hot dipped galvanizing, and shall conform to ANSI C80.1 and UL.
3. Couplings and bushings shall be galvanized steel.

4. Pipe sealant required at all threaded joints.
5. Conduit shall be buried at least one foot (12") below ground surface, unless greater depths are required by local code.
6. Refer to Plans for bedding and cover requirements; do not cover conduit with stones greater than 1 inch.
7. Provide warning tape no less than six inches (6″) above the highest of the buried conduits.
8. Running threads are not acceptable.

C. Interior Locations:

1. Conduit shall be liquid tight and shall have an interlocking flexible galvanized steel core with permanently bonded continuous exterior gray polyvinyl chloride jacket. Exterior jacket shall be moisture and oil proof, and UV protected. A copper bonding conductor shall be included between the segments. Interior surfaces shall be smooth and offer minimum drag to pulling conductors.
2. Fittings: Connectors shall be the screw clamp or screw in (Jake) variety with cast malleable iron bodies and threaded male hubs with insulated throats or insulated bushings. Liquid tight fittings shall be of cadmium plated cast malleable iron, with insulated throat, with provisions for grounding.

2.02 MISCELLANEOUS ELECTRICAL EQUIPMENT

A. Conduit Straps: If called for on the Plans, conduit straps shall be malleable iron constructed, one hold type strap with cast clam backs and spacers as required.

PART 3 – EXECUTION

3.01 CONDUIT INSTALLATION

A. General:

1. Install conduit and electrical equipment in locations that will cause minimal interference with the maintenance and removal of mechanical equipment.
2. Conduits and connections are shown schematically on the Plans. Run conduit in a neat manner parallel or perpendicular to walls and slabs, and wherever possible, installed together in parallel runs supported with unistrut-type support system.
3. All conduits shall be installed straight and true with reference to the adjacent Work.
4. Unless noted otherwise, buried conduit shall be installed with a minimum of twelve inches (12″) cover. Buried conduit shall be installed using NEC-approved plastic cradles, properly supported/anchored and of sufficient numbers to prevent movement during construction and backfill operations.
5. Exposed conduit shall be supported with unistrut supports at a maximum spacing of 8 feet and within 18 inches of couplings, boxes, etc., unless otherwise shown.
6. All conduits shall be tightly sealed during construction by use of conduit plugs or "pennies" set under bushings.
7. All conduits in which moisture or any foreign matter has collected before pulling conductors shall be cleaned to the satisfaction of the Engineer.
8. All conduit reamed smooth before installation.

9. Liquid Tight Flexible Metallic Conduit Liquid tight conduit shall be installed in all locations for connections to all motors, solenoid valves, HVAC equipment, and similar devices.
10. Prior to installation of conductors in underground conduits, a testing mandrel not less than six inches (6") long and with a diameter 1/4 inch less than the conduit diameter shall be drawn through, after which a stiff bristle brush of the proper size for the conduits shall be drawn through until the conduits are free of all sand and gravel.

3.02 PROTECTION

A. Conduits, junction boxes, outlet boxes, and other openings shall be kept closed to prevent entry of foreign matter. Fixtures, equipment, and apparatus shall be covered and protected against dirt, paint, water, chemical or mechanical damage, before and during the construction period.

B. Damaged fixtures, apparatus, or equipment shall be restored to original condition prior to final acceptance, including restoration of damaged shop coats of paint. Brightly finished surfaces and similar items shall be protected until in service. No rust or damage will be permitted.

3.03 WORKMANSHIP

A. Preparation, handling, and installation shall be in accordance with manufacturer's written instructions and technical data particular to the product specified and/or approved, except as otherwise specified.

B. Work shall be furnished and placed in coordination and cooperation with other trades.

C. Work shall conform to the National Electrical Contractor's Association Standard of Installation for general installation practice.

D. Work areas shall be kept clean and free of debris at the end of each workday.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 16060

POWER AND STANDBY POWER

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Conform to General and Supplementary Conditions, the modifications thereto, and Division 1 General Requirements for all work in Division 16.

1.02 PROJECT DESCRIPTION

A. This project consists of the complete design and installation of power and standby power for the Hot Water Flushing Remediation equipment at the Skykomish School.

1.03 SCOPE OF WORK

A. The work under this Division includes furnishing all materials, equipment, labor, supervision, tools and items necessary for the design, permitting, construction, installation, connection, testing and operation of all electrical work for this project as defined in this document and as shown on project drawings.

B. Contractor's Design Responsibility: This project is Design-Build. The Contractor shall become the "Engineer of Record" and shall provide errors and omissions insurance and electrical engineer's seal and signature on the electrical drawings and specifications. It will be the Contractor's responsibility to design and provide complete drawings, specifications, and calculations and submit for agency approval to the authority having jurisdiction.

C. Design Coordination: The design/build contractor shall thoroughly review mechanical drawings in order to provide a well coordinated design. Coordinate locations of all electrical equipment.

D. Systems: Provide design, labor, materials and appliances and perform operations in connection with satisfactory installation of electrical work ready to operate in strict accordance with these specifications and drawings.

E. Facilities: Provide electrical systems to support construction as follows. Description of work is general. Refer to mechanical plans, civil plans, and electrical plans for further details of required work.

1. Power Service:
    a. Coordinate requirements for a 480V, 3 phase service to the Site with Puget Sound Energy (PSE).
    b. Provide all infrastructure required for PSE service to the Site including conduits, weatherheads, CT cabinet, meter base, vaults, and transformer pad.
    c. Service shall be sized per electrical load calculations.
    d. All equipment and materials shall conform with PSE standards.
2. Power Distribution System:
    a. Provide main distribution panel, branch panels, transformers and feeders per one line diagram.

b. Provide branch circuitry as required to lights, receptacles, mechanical units, and equipment.
c. Perform load calculations to verify capacity of equipment, feeders, and branch circuits.
d. All equipment shall be suitable for outdoor installation and use. Enclosures shall be NEMA 3R.

3. Standby Power System:
   a. Provide standby generator system per one line diagram.
   b. Generator shall be diesel fueled, 480V, 3 phase, 60 KW. Provide in factory weatherproof, sound attenuated enclosure. Fuel tank shall be a base tank sized for 72 hour run time at full capacity.
   c. Provide automatic transfer switch rated for outdoor use. Provide all control circuitry required between generator and ATS to start generator and transfer power in a power failure event.
   d. Provide automatic load shedding as required to ensure generator is not overloaded.

1.04 TERMS OF CONTRACT

A. Design: The calculations and construction documents shall be developed by or under the supervision of a Professional Engineer registered in the State of Washington. The submittal of these items shall include the official stamp and signature of this Engineer.

B. Plans and Coordination: Provide final drawings in accordance with project schedule.

1.05 SUBMITTALS

A. Contractor shall submit for review, equipment and materials cut sheets including all pertinent performance information, code compliance information, and installation procedures.

B. Submit prior to fabrication or delivery.

C. Submit complete at one time.

D. Catalog sheets shall be complete and the item or model to be used shall be clearly marked.

1.06 ELECTRICAL PERMIT AND CONSTRUCTION DOCUMENTS

A. At a minimum, construction/permit documents shall show complete design of all requirements of this specification and the drawings. Electrical is Bidder Design Work.

B. Construction documents shall be 100% complete at date of Electrical Permit submission.

C. Show all equipment, circuitry, and devices on plans. Provide abbreviations and legend including description of all devices shown on plans.

1.07 DOCUMENTATION

A. Permits: Submitted for, paid for, and obtained by the contractor.

B. Calculations: Provide all required calculations to the AHJ including electrical load calculations.

C. Record Drawings: See Division 1. Provide two sets of record drawings.

1.08 MECHANICAL

A. Coordinate with mechanical contractor to determine all mechanical units requiring power connections.

B. Provide circuitry, starters, and disconnects as required for all mechanical units.

1.09 WARRANTY

A. Warrant materials and workmanship for one year in accord with Division 0. Provide written guarantees. Submit with Operating and Maintenance Manual. Warrant period to extend from date of substantial completion.

1.10 COORDINATION OF WORK

A. Coordinate design and shop drawings to preclude interference between trades. Conflicts shall be brought to the attention of the Owner prior to installation.

B. Insure proper "rough-in" on all equipment to which connections are made.

C. Verify all measurements at the job site.

1.11 HANDLING

A. Deliver packaged materials in unbroken packages with manufacturer's label thereon.

1.12 CHANGE OF WORK ORDERS

A. All requests for change of work or scope shall be submitted in writing to the General Contractor.

B. Unapproved or unauthorized changes of work or additional work shall not be considered for payment.

1.13 CLEANING UP AND HOUSEKEEPING

A. Leave all equipment clean and ready for use.

B. Remove all labels, paint, plaster, etc. from fixtures, equipment, and conduit.

C. At final completion, remove all rubbish and waste resulting from the work from the Site.

D. On a periodic basis, remove all waste from working areas and Site so that orderly construction may continue.

1.14 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

A. Provide per Division 1.

1.15 RECORD DRAWINGS

A. Provide per Division 1.

1.16 WORKMANSHIP

A. All work shall be installed in accordance with best trade practice. Any substandard workmanship shall be removed and replaced at no extra cost to the Owner.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Provide products suitable for the use and installation conditions.

B. All products shall comply with requirements of National Electrical Code and local code authority. Equipment shall be UL listed where required.

C. Provide all materials, devices, and equipment necessary for a complete and fully functional electrical installation.

PART 3 - EXECUTION

3.01 DESIGN CRITERIA

A. Design shall comply with all applicable codes including, but not limited to, National Electrical Code, International Building Code, International Fire Code, and Washington State Energy Code.

B. Design shall comply with requirements of authority having jurisdiction.

END OF SECTION

BNSF – Skykomish School HWF Remediation

SECTION 16231

STANDBY GENERATOR

PART 1 – GENERAL

1.01 SUMMARY

A. A standby generator will be installed to provide backup power to the soil vapor extractor (SVE)/Equipment Enclosure, including the SVE blower and related systems. An automatic transfer switch will automatically start the generator in the event of loss of utility power so that the operation of the SVE system is maintained.

B. Provide design and engineering, labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for a standby power systems generator set as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

C. Related Sections:

1. Section 02600 – Electrical

1.02 PROJECT CONDITIONS

A. Expected backup generator loads consist of SVE Blower (15 horsepower) - 17.46 kVA, Moisture Separator Transfer Pump (1 hp) - 1.75 kVA, 240/120 volt (V) Panel - 25.98 KVA (this Panel will require 30 kVA step-down transformer). The generator will have a combined connected load of 45.19 kVA, with a demand load of 49.08 kVA. A 60 kilowatt (kW) generator is required to accommodate all loads.

1.03 SUBMITTALS

A. All submittals shall be completed in accordance with Section 01330 - Submittal Procedures.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Product data shall include, but shall not be limited to, the following:

1. Paragraph by paragraph specification compliance statement describing the differences between the specified and the proposed equipment.
2. Manufacturer's certification of prototype testing.
3. Manufacturer's published warranty documents.
4. Manufacturer's installation instructions.

C. Shop Drawings: Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer's standard product data, including, but not limited to, shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.

D. Wiring Diagrams: Submit wiring diagrams detailing power, signal, and control systems, clearly differentiating between manufacturer installed wiring and field installed wiring, and between components provided by the manufacturer and those provided by others. Submit interconnection wiring diagrams showing external connections required, with field wiring terminals marked in a consistent point to point manner.

E. Operation and Maintenance Data: Submit operation and maintenance data to include in operation and maintenance manuals.

F. Additional submittals shall be in accordance with other specifications herein.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of standby power system generator set of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 20 years.

1. The manufacturer shall be ISO 9001 certified and the products shall be designed to internationally accepted standards.

B. Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing a standby power system generator set similar in type and scope to that required for this Project.

C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of federal, state, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

D. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include, but shall not be limited to, necessary features to meet the requirements of these standards.

1. Canadian Standards Association (CSA) 282.
2. American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE) 446.
3. National Fire Protection Association (NFPA) 37.
4. National Electrical Code (NEC). Equipment shall be suitable for use in systems in compliance with Articles 700, 701, and 702.
5. NFPA 99. Note: manufacturer's equipment not recommended for use in NFPA 99 systems.
6. NFPA 110. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit; component level type tests shall not substitute for this requirement. Note: manufacturer's equipment not recommended for use in NFPA 110 required systems.

E. The generator set and supplied accessories shall meet the requirements of the following standards:

1. National Electrical Manufacturers Association (NEMA) MG 1, Part 32. Alternator shall comply with the requirements of this standard.
2. Underwriters Laboratories (UL) 142.
3. UL 1236.
4. UL 2200. The generator set shall be listed to UL 2200.

F. The control system for the generator set shall comply with the following requirements:

1. CSA C22.2, No. 14.
2. EN 50082 2.
3. EN 55011.
4. Federal Communications Equipment (FCC) Part 15, Subpart B.
5. International Electrotechnical Commission (IEC) 8528 4.
6. IEC 801.2, IEC 801.3, and IEC 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
7. UL 508. The entire control system of the generator set shall be UL 508 listed and labeled.
8. UL 1236.

G. The generator set manufacturer shall be certified to ISO 9001 and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

H. Factory Testing:

1. The generator set manufacturer shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.
2. Factory testing may be witnessed by the Owner and consulting engineer. Costs for travel expenses will be the responsibility of the Owner and consulting engineer. Supplier shall be responsible to provide two weeks' notice for testing.
3. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include, but shall not be limited to, run at full load, maximum power, voltage regulation, transient and steady state governing, single step load pickup, and function of safety shutdowns.

I. Contractor shall conduct installation in accordance with an approved schedule submitted as part of the submittals section.

J. Equipment testing and certifications will be required for the modules prior to shipment.

K. References listed below form a part of this specification to the extent referenced:

1. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEEERS (IEEE).

a. ANSI/IEEE 446, "Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications" (copyrighted by IEEE, ANSI approved).ASME INTERNATIONAL (ASME)

2. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

a. NEMA MG 1, "Motors and Generators."

3. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

a. NFPA 37, "Standard for the Installation and Use of Stationary Combustion Engines and "Gas Turbines" (copyrighted by NFPA, ANSI approved).

b. NFPA 70, "National Electrical Code" (copyrighted by NFPA, ANSI approved), hereinafter referred to as NEC.

c. NFPA 99, "Standard for Health Care Facilities" (copyrighted by NFPA, ANSI approved).

d. NFPA 110, "Standard for Emergency and Standby Power Systems" (copyrighted by NFPA, ANSI approved).

4. UNDERWRITER LABORATORIES, INC (UL):

a. UL 142, "Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids" (copyrighted by UL, ANSI approved).

b. UL 499, "Standard for Electric Heating Appliances."

c. UL 508, "Standard for Industrial Control Equipment" (copyrighted by UL, ANSI approved).

d. UL 1236, "Standard for Battery Chargers" (copyrighted by UL, ANSI approved).

e. UL 1446, "Standard for Systems of Insulating Materials General."

f. UL 2200, "Standard for Stationary Engine Generator Assemblies."

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Product specified is "Standby Power Systems Generator Set" as manufactured by APC by Schneider Electric, or equivalent. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable. The Architect/Engineer will be the sole judge of the basis of what is equivalent.

2.02 ENGINE AND ENGINE EQUIPMENT

A. The engine shall be diesel, four cycle, radiator and fan cooled. The hp rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable. Engine accessories and features shall include, but shall not be limited to, the following:

1. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a

function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, and accelerating to rated speed. The governing system shall include, but shall not be limited to, a programmable warm up at idle and cool down at idle function. While operating in idle state, the control system shall disable the alternator excitation system.

2. Skid mounted radiator and cooling system rated for full load operation in 115 degrees Fahrenheit (F) (46 degrees Celsius [C]) ambient temperature as measured at the alternator air inlet. Radiator fan shall be suitable for use in a system with 0.5 in H_2O restriction. Radiator shall be sized based on a core temperature that shall be 20 degrees F higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Radiator shall be provided with a duct adapter flange. The equipment manufacturer shall fill the cooling system with a 50/50 ethylene glycol/water mixture prior to shipping. Rotating parts shall be guarded against accidental contact.
3. Electric starter(s) capable of three complete cranking cycles without overheating.
4. Positive displacement, mechanical, full pressure, lubrication oil pump.
5. Full flow lubrication oil filters with replaceable spin on canister elements and dipstick oil level indicator.
6. An engine driven, mechanical, positive displacement fuel pump. Provide fuel filter with replaceable spin on canister element. Fuel cooler, suitable for operation of the generator set at full rated load in the ambient temperature specified, shall be provided if required for operation due to the design of the engine and the installation.
7. Replaceable dry element air cleaner with restriction indicator.
8. Flexible supply and return fuel lines.
9. Engine mounted battery charging alternator, 40 amperes minimum, and solid state voltage regulator.
10. Coolant heater.
    a. Engine mounted, thermostatically controlled coolant heater for each engine. Heater voltage shall be as shown on the Drawings. The coolant heater shall be UL 499 listed and labeled.
    b. The coolant heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches (305 mm). The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall provide provisions to isolate the heater for replacement of the heater element without draining the coolant from the generator set. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.

c. The coolant heater shall be provided with a DC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system.

d. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 104 degrees F (40 degrees C) in a 40 degrees F (4 degrees C) ambient, in compliance with NFPA 110 requirements, or the temperature required for starting and load pickup requirements of this section.

11. Vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer. Isolators shall include, but shall not be limited to, seismic restraints if required by site location.

12. Starting and control batteries shall be calcium/lead antimony type, 12 volts DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors. The batteries shall be capable of a minimum of three complete 15 second cranking cycles at 40 degrees F (4 degrees C) ambient temperature when fully charged.

13. Exhaust silencer(s) for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. The mufflers shall be critical grade. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards.

14. A UL listed/CSA certified 15 ampere voltage regulated battery charger shall be provided for each engine generator set. The charger shall be located in the generator enclosure. AC input voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper, and equalize charge settings. Monitors shall provide visual output for:

    a. Loss of AC power, red light.

    b. Low battery voltage, red light.

    c. High battery voltage, red light.

    d. Power on, green light.

15. Charger to be monitored by engine controls and cause alarm condition at ATS when used in conjunction with compatible ATS.

16. A dual wall sub base fuel storage tank with 70 gallon (265 l) (80 kW) or 173 gallon (655 l) (125 kW and 200 kW) capacity. The tank shall be constructed of corrosion resistant steel and shall be UL listed. The equipment, as installed, shall meet local and regional requirements for aboveground tanks.

2.03 AC GENERATOR

A. The AC generator shall be synchronous, four pole, 2/3 pitch, revolving field, drip proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. Insulation system components shall meet NEMA MG 1 temperature limits for Class H insulation system and shall be UL 1446 listed. Actual temperature rise measured by resistance method at full load shall not exceed 257 degrees F (125 degrees C).

B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300 percent of rated current for not more than 10 seconds.

D. The subtransient reactance of the alternator shall not exceed 15 percent, based on the standby rating of the generator set.

2.04 GENERATOR SET CONTROL

A. The generator set shall be provided with a microprocessor based control system that shall be designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this section.

B. The control shall be mounted on the generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

C. The generator set mounted control shall include, but shall not be limited to, the following features and functions:

1. Control Switches:

   a. Provide a mode select switch. The mode select switch shall initiate the following control modes: When in the run or manual position, the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. A separate push button to initiate starting shall be acceptable. In the off position, the generator set shall immediately stop, bypassing all time delays. In the auto position, the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.

   b. Provide an emergency stop switch. Switch shall be red mushroom head push button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and to be locked out from automatic restarting.

   c. Provide a reset switch. The reset switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.

   d. Provide a panel lamp switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.

2. Generator Set AC Output Metering: The generator set shall be provided with a metering set, including, but not limited to, the following features and functions:

a. Digital metering set, 1 percent accuracy, to indicate generator root mean square (RMS) voltage and current, frequency, output current, output kW, kW hours (kWh), and power factor. Generator output voltage shall be available in line to line and line to neutral voltages, and shall display all three-phase voltages (line to neutral or line to line) simultaneously.

b. Digital voltmeter, ammeter, frequency meter, power factor meter, and kW meter. Voltmeter and ammeter shall display all three phases. Meter scales shall be color coded in the following fashion: green shall indicate normal operating condition, amber shall indicate operation in ranges that indicate potential failure, and red shall indicate failure impending. Metering accuracy shall be within 1 percent at rated output.

c. The control system shall monitor the total load on the generator set and maintain data logs of total operating hours at specific load levels ranging from 0 percent to 110 percent of rated load, in 10 percent increments. The control shall display hours of operation at less than 30 percent load and total hours of operation at more than 90 percent of rated load.

d. The control system shall log total number of operating hours, total kWh, and total control on hours, as well as total values since reset.

3. Generator Set Alarm and Status Display: The generator set control shall include, but shall not be limited to, LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. Functions indicated by the lamps shall include, but shall not be limited to, the following:

   a. The control shall include, but shall not be limited to, green lamps to indicate that the generator set is running at rated frequency and voltage, and that a remote start signal has been received at the generator set. The running signal shall be based on actual sensed voltage and frequency on the output terminals of the generator set.

      i. The control shall include, but shall not be limited to, a flashing red lamp to indicate that the control is not in automatic state, and red common shutdown lamp.

      ii. The control shall include, but shall not be limited to, an amber common warning indication lamp.

      iii. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. Conditions indicated below for warning shall be field configurable for shutdown. Conditions required to be annunciated shall include, but shall not be limited to, the following:

         a) Low oil pressure (warning).

         b) Low oil pressure (shutdown).

         c) Oil pressure sender failure (warning).

         d) Low coolant temperature (warning).

         e) High coolant temperature (warning).

         f) High coolant temperature (shutdown).

g) High oil temperature (warning).

h) Engine temperature sender failure (warning).

i) Low coolant level (warning).

j) Fail to crank (shutdown).

k) Fail to start/overcrank (shutdown).

l) Overspeed (shutdown).

m) Low DC voltage (warning).

n) High DC voltage (warning).

o) Weak battery (warning).

p) High AC voltage (shutdown).

q) Low AC voltage (shutdown).

r) Under frequency (shutdown).

s) Overcurrent (warning).

t) Overcurrent (shutdown).

u) Short circuit (shutdown).

v) Ground fault (warning) (optional when required by code or specified).

w) Over load (warning).

x) Emergency stop (shutdown).

4. Engine Status Monitoring:

   a. The following information shall be available from a digital status panel on the generator set control:

      i. Engine oil pressure (psi or kPa).

      ii. Engine coolant temperature (degrees F or degrees C).

      iii. Engine oil temperature (degrees F or degrees C).

      iv. Engine speed (rpm).

      v. Number of hours of operation (hours).

      vi. Number of start attempts.

      vii. Battery voltage (DC volts).

   b. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.

5. Engine Control Functions:

   a. The control system provided shall include, but shall not be limited to, a cycle cranking system, which shall allow for Owner selected crank time, rest time, and number of cycles. Initial settings shall be for three cranking periods of 15 seconds each, with a 15 second rest period between cranking periods.

b. The control system shall include, but shall not be limited to, an idle mode control, which shall allow the engine to run in idle mode in the run position only. In this mode, the alternator excitation system shall be disabled.

c. The control system shall include, but shall not be limited to, an engine governor control, which shall function to provide steady state frequency regulation as noted elsewhere in this section. The governor control shall include, but shall not be limited to, adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.

d. The control system shall include, but shall not be limited to, time delay start (adjustable 0 second to 300 seconds) and time delay stop (adjustable 0 second to 600 seconds) functions.

e. The control system shall include, but shall not be limited to, sender failure monitoring logic for speed sensing, oil pressure, and engine temperature, which shall be capable of discriminating between failed sender or wiring components and actual failure conditions.

6. Alternator Control Functions:

a. The generator set shall include, but shall not be limited to, a full wave rectified automatic digital voltage regulation system that shall be matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from miss operation due to load induced voltage waveform distortion and shall provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three phase line to neutral RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include, but shall not be limited to, a torque matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristic shall be adjustable for roll off frequency and rate, and shall be capable of being curve matched to the engine torque curve with adjustments in the field. The voltage regulator shall include, but shall not be limited to, adjustments for gain, damping, and frequency roll off. Adjustments shall be broad range and shall be made via digital switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.

b. Controls shall be provided to monitor the output current of the generator set and to initiate an alarm (overcurrent warning) when load current exceeds 110 percent of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (overcurrent shutdown). The protective functions provided shall be in compliance to the requirements of NEC, Article 445.

c. Controls shall be provided to individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The

protective functions provided shall be in compliance with the requirements of NEC, Article 445.

d. Controls shall be provided to monitor the kW load on the generator set, and shall initiate an alarm condition (overload) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include, but shall not be limited to, a load shed control, to operate a set of dry contacts (for use in shedding Owner load devices) when the generator set is overloaded.

e. An AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110 percent of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130 percent. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85 percent for more than 10 seconds.

f. When required by NEC or as indicated on the Drawings, the control system shall include, but shall not be limited to, a ground fault monitoring relay. The relay shall be adjustable from 3.8 amperes to 1200 amperes, and shall include, but shall not be limited to, adjustable time delay of 0 second to 10.0 seconds. The relay shall be for indication only, and shall not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay that shall function correctly in system as installed.

g. The generator set control shall include, but shall not be limited to, a 120 volt AC control heater.

7. Other Control Function:

a. The generator set shall be provided with a network communication module to allow communication with the generator set control by remote devices. The control shall communicate engine and alternator data, and shall allow starting and stopping of the generator set via the network in both test and emergency modes.

b. A battery monitoring system shall be provided which shall initiate alarms when the DC control and starting voltage is less than 11 volts DC or more than 15 volts DC. During engine cranking (starter engaged), the low voltage limit shall be disabled, and DC voltage shall be monitored as load is applied to the battery, to detect impending battery failure or deteriorated battery condition.

c. The following information shall be communicated to the ATS when used with a compatible ATS:

i. An ATS designed and supplied by the same generator supplier shall be required to achieve all potential monitoring and control capabilities as detailed below:

a) Generator status event.

b) Low fuel level alarm.

c) Low fuel level alarm cleared.

d) Low runtime alarm.
e) Low runtime alarm cleared.
f) Very low fuel level alarm.
g) Very low fuel level alarm cleared.
h) Very low runtime alarm.
i) Very low runtime alarm cleared.
j) Service interval exceeded alarm.
k) Service interval exceeded alarm cleared.
l) Service record reset.
m) Low coolant level.
n) Low coolant level cleared.
o) Very low coolant level.
p) Very low coolant level cleared.
q) High coolant temperature.
r) High coolant temperature cleared.
s) Very high coolant temperature.
t) Very high coolant temperature cleared.
u) Low coolant temperature.
v) Low coolant temperature cleared.
w) Low oil level.
x) Low oil level cleared.
y) Low battery voltage during crank.
z) Low battery voltage during crank cleared.
aa) Very low battery voltage during crank.
bb) Very low battery voltage during crank cleared.
cc) Local e stop.
dd) Local e stop cleared.
ee) Remote e stop.
ff) Remote e stop cleared.
gg) High battery voltage.
hh) High battery voltage cleared.
ii) Low battery voltage.
jj) Low battery voltage cleared.
kk) Control switch not in auto.
ll) Control switch not in auto cleared.

mm) Low oil pressure.

nn) Low oil pressure cleared.

oo) Very low oil pressure.

pp) Very low oil pressure cleared.

qq) Overload.

rr) Overload cleared.

ss) Low AC voltage.

tt) Low AC voltage cleared.

uu) Ready for load.

vv) Ready for load cleared.

ww) Common fault.

xx) Common fault cleared.

yy) High AC voltage.

zz) High AC voltage cleared.

aaa) Overspeed.

bbb) Overspeed cleared.

ccc) Engine cold, may not start.

ddd) Engine cold, may not start cleared.

eee) Output breaker off.

fff) Output breaker off cleared.

ggg) Generator shutdown, will not start.

hhh) Generator shutdown, will not start cleared.

iii) Generator battery charger voltage low.

jjj) Generator battery charger voltage low cleared.

kkk) Generator fuel level.

lll) Generator runtime with and without generator running.

mmm) Genset hardware data.

nnn) Software version level.

ooo) Fault history.

ppp) Event log.

qqq) Generator output breaker position status.

rrr) Engine starting battery voltage.

sss) Engine starting battery weak warning.

ttt) Engine oil lube pressure.

uuu) Engine lube oil level.

vvv) Engine coolant temperature.

www) Engine coolant level.

xxx) Engine operating hours.

yyy) Number of starts.

zzz) Engine rpm.

aaaa) Output power, kW and PF.

bbbb) Generator total kWh.

cccc) Generator total kWh.

dddd) Percent governing and percent voltage regulation.

eeee) Overspeed.

ffff) Overcrank.

8. Control Interfaces for Remote Monitoring:

   a. A fused 10 ampere switched 12 volt DC power supply circuit shall be provided for the Owner's use. DC power shall be available from this circuit at all times from the engine starting/control batteries.

   b. The control shall be provided with a direct serial communication link for the communication network interface with a compatible ATS as described elsewhere in this section and as shown on the Drawings.

2.05 OTHER EQUIPMENT TO BE PROVIDED WITH THE GENERATOR SET

A. The generator set shall be provided with a mounted main line circuit breaker, sized to carry the rated output current of the generator set. The circuit breaker shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal magnetic trip with other overcurrent protection devices that shall positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided.

B. Provide outdoor weather-protective enclosure as follows:

1. The generator set shall be provided with an outdoor enclosure, with the entire package listed under UL 2200. The package shall comply with the requirements of NEC for wiring materials and component spacing. The total assembly of generator set, enclosure, and sub-base fuel tank (when used) shall be designed to be lifted into place using spreader bars. Housing shall provide ample airflow for generator set operation at rated load in an ambient temperature of 100 degrees F (38 degrees C). The housing shall have hinged access doors as required to maintain easy access for operating and service functions. Doors shall be lockable. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. Electrical power and control interconnections shall be made within the perimeter of the enclosure.

2. Sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a two-step electro-coating paint process, or equal, meeting the performance requirements specified below. Surfaces of metal

parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:

a. Primer thickness shall be 0.5 mil (0.13 mm) to 2.0 mils (0.51 mm). Top coat thickness shall be 0.8 mil (0.20 mm) to 1.2 mils (0.30 mm).

b. Gloss, per ASTM D 523, shall be 80 percent, ±5 percent. Gloss retention after one year shall exceed 50 percent.

c. Crosshatch adhesion, per ASTM D 3359, shall be 4B to 5B.

d. Impact resistance, per ASTM D 2794, shall be 160 inch pounds (13.56 N•m) to 160 inch pounds (18.08 N•m).

e. Salt spray, per ASTM B 117, shall be 1,000+ hours.

f. Humidity, per ASTM D 2247, shall be 1,000+ hours.

g. Water soak, per ASTM D 2247, shall be 1,000+ hours.

3. Painting of hoses, clamps, wiring harnesses, and other nonmetallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.

4. Enclosure shall be constructed of minimum 12 gage steel for framework and 14 gage steel for panels. Hardware and hinges shall be stainless steel.

5. A factory mounted exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.

6. The enclosure shall include, but shall not be limited to, the following maintenance provision:

   a. Flexible coolant and lubricating oil drain lines that shall extend to the exterior of the enclosure, with internal drain valves.

7. Provide external radiator fill provision.

8. The generator set shall be provided with a sound attenuated housing that shall allow the generator set to operate at full rated load in an ambient temperature of up to 100 degrees F (38 degrees C). The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 72 dBA at any location 23 feet (7 m) from the generator set in a free field environment.

9. The enclosure shall be insulated with non-hygroscopic materials.

C. Provide a sub-base fuel tank for the generator set, sized to allow for full load operation of the generator set for 12 hours. The sub-base fuel tank shall be UL 142 listed and labeled. Installation shall be in compliance to NFPA 37. The fuel tank shall be a double walled, steel construction and shall include, but shall not be limited to, the following features:

1. Emergency tank and basin vents.

2. Mechanical level gauge.

3. Fuel supply and return lines, connected to generator set with flexible fuel lines as recommended by the engine manufacturer and in compliance to UL 2200 and NFPA 37 requirements.
4. Leak detection provisions, wired to the generator set control for local and remote alarm indication.
5. Continuous float level gauge. Wire gauge to generator control to be remote indication of fuel level and runtime when used with compatible ATS.
6. Basin drain.
7. Integral lifting provisions.
8. Overfill catch basin with drain.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect/Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.02 INSTALLATION

A. General: Preparation and installation shall be in accordance with reviewed product data, final shop drawings, manufacturer's written recommendations, and as indicated on the Drawings.

1. Equipment shall be installed in accordance with final submittals and the Contract Documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
2. Installation of equipment shall include, but shall not be limited to, providing interconnecting wiring between major equipment provided for the on-site power system. Also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
3. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.
4. Equipment shall be initially started and operated by representatives of the manufacturer.
5. Equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall

be thoroughly cleaned to remove dirt and construction debris prior to initial operation and final testing of the system.

B. Sequence of Operation:

1. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control and a redundant signal over the required network connection.
2. The generator set shall complete a time delay start period as programmed into the control.
3. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include, but shall not be limited to, the following functions:
   a. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control system shall shut down and lock out the generator set, and indicate fail to crank shutdown.
   b. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this section. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate fail to start.
   c. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.
   d. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous state.
   e. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.
   f. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.
   g. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

3.03 FIELD QUALITY CONTROL

A. On-site acceptance test shall be as follows:

1. The complete installation shall be tested for compliance with this section following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by the Contractor. The Owner shall be notified in advance and shall have the option to witness the tests.
2. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing

proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

B. The manufacturer of the generator set shall maintain service parts inventory at a central location that shall be accessible to the service location 24 hours per day, 365 days per year.

C. The generator set shall be serviced by a local service organization that shall be trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

D. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

3.04 DEMONSTRATION

A. Provide the services of a factory authorized service representative of the manufacturer to provide start up service and to demonstrate and train the Owner's personnel.

1. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
2. Train the Owner's maintenance personnel on procedures and schedules related to start up and shutdown, troubleshooting, servicing, and preventive maintenance.
3. Review data in operation and maintenance manuals with the Owner's personnel.
4. Schedule training with the Owner, through the Architect/Engineer, with at least seven days' advance notice.

B. Provide factory test, start up by a supplier authorized by the equipment manufacturer, and on-site testing of the system.

C. Contact equipment supplier if training is required for the facility operating personnel covering operation and maintenance of the equipment provided.

3.05 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to the Installer, which shall ensure that the standby power system generator set shall be without damage at time of Substantial Completion.

END OF SECTION