City of Ferndale

Whatcom County, Washington

Contract Documents
for the Construction of

FERNDALE SEWER PUMP STATION #4 UPGRADE

City of Ferndale - Project # SS 2014-05
Wilson Engineering, LLC – Project # 2013-037

WILSON ENGINEERING, L.L.C.
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April 21, 2015
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4-21-2015

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ADVERTISEMENT FOR BIDS

Project Name:	**Ferndale – Sewer Pump Station #4 Upgrade**
Bid Date:	**May 7, 2015 (3:00 PM)**
Estimated Cost Range of Project:	**$700,000 to $900,000**
Engineer:	**Wilson Engineering L.L.C., Bellingham, WA**

NOTICE TO BIDDERS: Sealed bids will be received from contractors by the Public Works Director, City of Ferndale, 2095 Main Street, P.O. Box 936, Ferndale, WA 98248 until 3:00 pm, Thursday, May 7, 2015 for the Pump Station #4 Upgrade. All bids shall be received in sealed envelopes with "PUMP STATION #4 UPGRADE" marked plainly thereon. The Project involves removal of existing pumps & valves and installation of new pumps, valves, controls, backup generator, 8' diameter wet well, site work, and related work. In addition, the existing buried fuel tank is to be evaluated and removed per DOE requirements. Said bids will then and there be opened and read aloud. Bidders and other properly interested parties are invited to be present at the bid opening. Bids received after the time fixed for opening cannot be considered.

The Contract Documents may be obtained from Wilson Engineering L.L.C., 805 Dupont Street, Bellingham, WA 98225. Please contact Jeff Christner, Wilson Engineering, (360) 733-6100, for project information. There is a $75 non-refundable charge for hard copies of the Contract Documents. Only bids from bidders who have obtained the Contract Documents and have requested to be listed on the Planholders' List, will be accepted. Copies of plans and specifications are on file for review at various construction councils and online at http://www.wilsonengineering.com/bidding-documents.aspx.

A deposit in the form of a postal money order, cashier's check, or bond in the amount of 5% of the greatest amount bid must be submitted with each bid proposal. Should the successful bidder fail to enter into a contract or furnish a satisfactory contract bond within the time stated in the specifications, the deposit shall be forfeited to the City.

There will be a pre-bid meeting for the Project held at 10:00 am, Thursday, April 30, 2015, at City Hall, 2095 Main Street, Ferndale, WA 98248. A site visit will follow the meeting. Pre-bid meeting is not mandatory.

The City shall reject any bid not accompanied by bid security. The City reserves the right to reject any or all bids if such action is in the best interest of the City. The City of Ferndale is an equal opportunity and affirmative action employer. Small, Minority and Women-owned businesses are encouraged to submit bids.

The project will be funded by the City of Ferndale. Neither the State of Washington nor any of its departments or employees are, or shall be, a party to this contract or any subcontract resulting from this solicitation for bids. All bidders must be licensed contractors registered in the State of Washington. All work performed on this project will be subject to prevailing state wage rates.

INSTRUCTIONS TO BIDDERS

1. Bidder Qualifications

A. Prospective Bidders shall be registered by the Washington State Department of Labor and Industries in accordance with state law.

B. Corporations shall be registered with the State of Washington, Office of the Secretary of State.

C. Bidders shall be regularly employed in the type of work contemplated herein.

2. Bidder's Representations

Submittal of a bid shall be deemed conclusive evidence that the bidder has:

A. Carefully examined the proposed work site, become familiar with conditions impacting the work, and incorporated such observations into the bid.

B. Read and understands the bidding and contract documents.

C. The bid is without exception based on the materials, equipment and systems required by the bidding documents.

D. The bid was made based on a complete set of Bidding Documents. The Owner is not responsible for any bidding errors resulting from the use of incomplete documents.

3. Document Interpretation

A. The bidder shall carefully study and review the Bid Documents and promptly report any errors or omissions to the Engineer.

B. Bidders or sub-bidders shall make any requests for clarification to the Engineer. If so directed, the Engineer may require the Bidder submit request in writing.

C. Interpretations, corrections and changes to the Bidding Documents shall be made by Addendum. Interpretations, corrections and changes to the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely on them.

D. Substitutions shall not be considered prior to the receipt of bids. The Owner is not responsible for any bidding errors resulting from the use of substitutions.

4. Addenda

A. Addenda will be mailed, delivered or faxed to all who are known by the Engineer to have received a complete set of Bidding Documents. Copies will also be provided to the locations where plans are available for review.

B. The Bidder shall acknowledge receipt of addenda in their bid.

5. Bidding Procedures

A. To be considered responsive, bids shall be submitted on the enclosed form and shall be filled in by typewriter or manually in ink.

B. The Bid form shall include the Bidder's legal name exactly as it appears on his/her registration. Form shall be signed by the individual authorized to represent the Bidder.

C. A list of subcontractors individually accounting for more than 10-percent of the Contract Sum and the work said subcontractor will perform shall be submitted with the bid or within one hour of the published bid time.

6. Pre-Bid Meeting

A. There will be a pre-bid meeting at date and time shown on the Invitation to Bid.

B. Prior to attending the prebid conference bidders shall have carefully studied and compared all drawings, specifications and other instructions to identify any inconsistency or omission. Also any discrepancies between the contract documents and the physical condition of the locality shall be identified. The intent is to identify any questions or concerns regarding the proposed improvements that the bidders may have.

7. Bid Security

A. Each Bid shall be accompanied by a Bid Security in the form of a cashier's check, certified check or surety bond equal to 5-percent of the total Bid amount. Security shall pledge that the Bidder shall enter into a contract with the Owner in accordance with the terms of the Bid Documents including furnishing payment and performance bonds.

B. In the event a Bidder refuses to enter into such contract or fail to furnish such bonds as required, the bid security shall be forfeited to the Owner as liquidated damages.

C. The Owner may retain bid securities submitted with the bid until such time as; (1) the contract has been executed and bonds received, (2) 30-days have elapsed, (3) all Bids have been rejected.

8. Submission of Bids

A. Bids shall be submitted in a sealed envelope. Envelopes shall clearly show (1) the project's name and owner as it appears on the Bid Solicitation, (2) the Contractor's name and registration number, and (3) the time and date of the bid opening.

B. Bids received after the published bid time and date will be returned unopened. The Bidder shall assume full responsibility for timely delivery of Bid.

C. Bids submitted by mail shall conform with the above requirements and be sent to City of Ferndale – City Hall, 2095 Main Street, P.O. Box 936, Ferndale, WA 98248, Attention: ***Pump Station #4 Upgrade Bid***. Bidder shall assume full responsibility for timely delivery of bid documents and the Owner is not responsible for bids received late.

D. Oral, facsimile or telegraphic bids, modifications, or adjustments are not valid and will not receive consideration.

9. Modification or Withdrawal of Bid

A. After the bid opening, bids shall not be withdrawn, modified or canceled by the Bidder during the stipulated time period.

B. Bids submitted by mail prior to the bid opening may be modified or withdrawn by notice to the Owner. Such notice shall be in writing and signed by the same authorized individual signing the bid form. If such modifications or withdrawals are transmitted electronically, the original document shall be mailed and postmarked on or before the date and time of the bid opening.

C. Withdrawn bids may be resubmitted up until the date and time of the bid opening and in accordance with these Instructions to Bidders.

D. Bid security shall be in an amount sufficient for the bid as modified or resubmitted.

10. Opening of Bids

A. Bids received on time will be opened and read aloud at the time and place stipulated in the Bid Solicitation. An abstract or tabulation will be made available to Bidders.

B. Should a Bidder discover an error in his/her bid after submittal, the Bidder may request withdrawal of the bid with the following conditions:

1. The Bidder must document the error(s) for the Owner. The Owner will review documentation and determine if the bid withdrawal and release of the Bid Security will be allowed.

2. The Owner must receive the Bidder's intent to withdraw his/her bid submittal in writing no more than 30-hours after the bid opening (faxed notice is acceptable).

3. The Owner alone will approve or disapprove the request for withdrawal. If approved, the Bidder will no longer be considered for Contract award and the Bid Security will be returned.

4. If the Bidder fails to notify the Owner in accordance of an error as set forth above, and the Owner awards the Bidder the Contract, the Bidder shall either execute the Contract for the bid amount or withdraw the bid and forfeit the Bid Security.

11. Rejection of Bids

A. The Owner reserves the right to reject any or all bids, reject a bid not accompanied by a proper bid security or other material required by the Bidding Documents, or reject a bid which is in anyway irregular or incomplete.

12. Acceptance of Bids

A. The Owner intends to award the Contract to the lowest responsible responsive bidder whose bid submittal does not exceed available funds and conforms with the requirements described herein. The Owner shall have the right to waive informalities or irregularities in a bid submittal and to accept the bid that, in the opinion of the Owner, is in the Owner's best interest.

B. Where called for, the Owner reserves the right to accept alternates in any combination and determine the low bidder on the basis of the base bid and alternates accepted.

13. Contract Bond

A. Bidders shall provide a contract bond as attached. Contract bond shall be signed by an approved surety or sureties, be in the full contract amount, and cover the faithful performance of the work described in the Contract Documents. The Contract Bond shall be in full effect until one year after Substantial Completion.

14. Contract Agreement and Award

A. Owner's execution of the contract is contingent on the timely receipt of the Contract Bond and other submittals required by the Contract Documents.

B. The award of the Contract, if it be awarded, shall be made within 45-days of the bid opening to the Bidder deemed by the Owner to be the lowest responsible responsive bidder.

C. The 45-day period may be extended by mutual consent of the bidder and the Owner. If, after the 45-day period and no agreement to time extension has been made, the Contractor may withdraw his bid.

15. Execution of Contract

A. The Bidder to whom the contract has been awarded shall sign the contract and return it and other submittals within 10 calendar days of the award.

B. The Owner shall have the right to reject a contract submitted by a bidder if it is qualified by reservations or conditions stipulated by the bidder or its surety.

C. No bid is binding on the Owner until executed by the City of Ferndale. No work shall be performed within the project site prior to the Notice to Proceed. Material or equipment orders or work undertaken away from the project site prior to contract execution shall be at the sole risk of the bidder.

16. Failure to Execute Contract

A. If the bidder to whom award has been made fails to sign the contract and furnish satisfactory bonds within 10 calendar days of the award, or declares in writing its intent not to execute the contract, the bid security will be forfeited to the Owner and the second lowest responsible bidder will be notified of its receipt of award.

B. If the second lowest responsible responsive bidder fails to execute the contract and furnish bonds within 20 calendar days after such notification, forfeiture of its bid security shall also be made and the third lowest responsible responsive bidder will be notified of its receipt of award, and in like manner until either (1) the contract and bond are executed by a responsible responsive bidder, (2) or further bid submittals are rejected, or (3) the number of bids submitted is exhausted.

C. If the contract is not executed by the Contractor and Owner within the stipulated time, and it is evident that circumstances warrant an extension of time, the Owner may extend the time for executing the contract and/or bond for a period not to exceed 10 additional calendar days.

17. Return of Bid Security

A. When bid submittals have been examined, bid securities and deposits accompanying submittals ineligible from further consideration will be returned.

C. All other bid securities and deposits will be held until the contract has been properly executed, after which bid securities and deposits except those subject to forfeiture will be returned.

SCOPE OF WORK AND DESCRIPTION OF BID ITEMS

Payment for the various items of the Proposal, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of WORK being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA).

No separate payment will be made for any item that is not specifically set forth in the Proposal, and all costs therefore shall be included in the prices named in the Proposal for the various appurtenant items of WORK.

BASE BID ITEM

1. Pump Station #4 Upgrade, Lump Sum

    A. Measurement for payment for individual items of the Pump Station #4 Upgrade will be based upon the unit values listed in the Schedule of Values submitted by the CONTRACTOR and reviewed and approved by the Engineer.

    B. Payment for the Pump Station #4 Upgrade will be made at the Lump Sum Price shown on PROPOSAL for Bid Item 1, which will constitute full compensation for all WORK as described in the Contract Documents.

FORCE ACCOUNT ITEM

2. Programming Services, price based on Force Account Total Sum (FA)

    A. Measurement for payment for Programming by L2 Systems, LLC (phone: 425-258-2402) will be based on the actual force account total of finished Programming Services work for Base Bid Items for startup and testing of the complete system (including all PLC, Operator Interface, and SCADA System programming) as directed by City Staff and per Contract Documents. Force account work to be per WSDOT Standard Specifications, Section 1-09.6.

    B. Payment for Programming will be made at the total sum of the actual force account, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications, including 2014 WSDOT requirements.

3. Misc. Additional Work Items, price based on Force Account Total Sum (FA)

   A. Measurement for payment for Misc. Additional Work Items will be based on the actual force account total of finished Misc. Additional Work Items for ADDITIONAL OWNER REQUESTED WORK ONLY as directed by City Staff and per Contract Documents. Force account work to be per WSDOT Standard Specifications, Section 1-09.6.

   B. Payment for Misc. Additional Work Items will be made at the total sum of the actual force account, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications, including 2014 WSDOT requirements.

UNIT QUANTITY BID ITEMS

4. Temporary Erosion Control, price based on Lump Sum (LS)

   This work consists of all temporary erosion and sediment control work (per Section 02370) in accordance with WSDOT, Whatcom County, and other applicable rules and regulations.

5. Trench Safety and Shoring, price based on Lump Sum (LS)

   This work consists of installing trench safety systems in accordance with WSDOT, OSHA, and other applicable rules and regulations.

6. Removal of Buried Concrete, price based on Cubic Yard (CY)

   Includes all costs associated with excavating, saw cutting (or breaking with a jack hammer), loading and removing buried slabs of concrete which are not visible from the surface (and not shown on drawings). This pay item is not applicable for concrete surfaces which are visible from surface prior to Construction activities.

   A. Measurement for payment for Buried Concrete Removal will be based on the actual quantity, Cubic Yards, of finished concrete removal.

   B. Payment for concrete removal, if any, will be made at the Unit Price shown on Proposal, said payment will constitute full compensation for all WORK which shall be in accordance with the applicable specifications.

7. HMA Cl. ½" PG 64-22, price based on Tons (TON)

   Includes all costs associated with preparing pavement area, providing, spreading, compacting, testing, seam sealing, and tack coating two 2" thick lifts (4" total thickness) of hot mix asphalt pavement with ½" aggregate per WSDOT standards Section 5-04, minimum density 90%. See detail A, sheet C4.2. Measurement and payment will be per TON of finished HMA pavement work.

8. Structural Fill for Pipe Zone Bedding, price based on Tons (TON)

   Includes all costs associated with providing, spreading, compacting, and testing Structural Fill for Pipe Zone Bedding per WSDOT Section 9-03.12(3) Gravel Backfill for Pipe Zone Bedding, minimum density per specifications. See detail F, sheet C4.2. Measurement and payment will be per TON of finished Structural Fill for Pipe Zone Bedding work.

9. Structural Fill for Trench Backfill, price based on Tons (TON)

   Includes all costs associated with providing, spreading, compacting, and testing Structural Fill for Trench Backfill per WSDOT Section 9-03.19 Bank Run Gravel for Trench Backfill, minimum density per specifications. See detail F, sheet C4.2. Measurement and payment will be per TON of finished Structural Fill for Trench Backfill work.

10. Crushed Surfacing Top Course, price based on Tons (TON)

    Includes all costs associated with providing, spreading, compacting, and testing Crushed Surfacing Top Course per WSDOT Section 9-03.9(3) Crushed Surfacing Top Course, minimum density 95%. Measurement and payment will be per TON of finished Crushed Surfacing Top Course work.

11. Crushed Surfacing Base Course, price based on Tons (TON)

    Includes all costs associated with providing, spreading, compacting, and testing Crushed Surfacing Base Course per WSDOT Section 9-03.9(3) Crushed Surfacing Base Course, minimum density 95%. Measurement and payment will be per TON of finished Crushed Surfacing Base Course work.

12. Gravel Base, price based on Tons (TON)

    Includes all costs associated with providing, spreading, compacting, and testing Gravel Base per WSDOT Section 9-03.10 Aggregate for Gravel Base, minimum density 95%. Measurement and payment will be per TON of finished Crushed Surfacing Base Course work.

13. Evaluation, Removal, and Documentation of Existing Buried Fuel Tank, price based on Lump Sum (LS)

    Includes all costs associated with removal of the existing 110 gallon buried fuel tank and disposal of tank, fuel line, fuel vent piping, day tank, fuel pump and miscellaneous accessories at an approved disposal site. This work requires observation and coordination with the WA Department of Ecology. Contractor is to prepare and submit an Intent to Close Underground Storage Tank 30-day Notice (form: ECY 020-95) to the Department of Ecology. In addition, Contractor is to perform an underground storage tank site assessment. Site assessment is to include field screening and collection of soil sample analytical results, and preparation/submittal of a UST Site Assessment Report with DOE's UST Site Check/Site Assessment Checklist. See notes and details on sheet C2.1.

BID PACKAGE

PROPOSAL

Name of Bidder: _____

Submittal of this Bid proposal warrants that the undersigned has:

1. Examined the site, plans and specifications, and laws and ordinances governing the work;
2. Agreed to perform the work complete and provide a facility in full operation, including all labor, materials and equipment in accordance with the terms and provisions of the Contract Documents and for the prices tendered;
3. Agreed to perform the work in accordance with the time of completion as set forth in Supplemental Conditions, after which specified liquidated damages will be assessed.
4. Not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action restraining free competitive bidding for the project.

BID SCHEDULE

The award of Bid Schedule shall be based on the lowest bid for Items 1-13, Alternatives will not be considered in the award of the bid. Should the use of alternate equipment require any changes in the layout or design of the facilities shown on the drawings, including modifications to electrical, structural, or mechanical work, the undersigned agrees to prepare and submit detailed drawings and specifications to the Engineer for review and approval showing all modifications in structures, piping, electrical, and mechanical work required to adapt the plans to the alternate equipment. The deduction amounts listed below shall take into account all required modifications and the contract time shall remain unchanged by selecting an Alternative.

BID ITEMS:

BASE BID ITEM

	Quantity/Unit	Amount
1. Pump Station #4 Upgrade,	Lump Sum	$_____

FORCE ACCOUNT BID ITEMS

2. Programming Services	Force Account	$ 35,000
3. Misc. Additional Work Items	Force Account	$ 35,000

UNIT QUANTITY BID ITEMS

	Quantity/Unit	Unit Price	Amount
4. Temporary Erosion Control	(1/LS)	$_____	$_____
5. Trench Safety and Shoring	(1/LS)	$_____	$_____
6. Removal of Buried Concrete	(10/CY)	$_____	$_____
7. HMA Class ½" Pavement	(40/TON)	$_____	$_____
8. Struc Fill for Pipe Zone Bedding	(100/TON)	$_____	$_____
9. Struc Fill for Trench Backfill	(900/TON)	$_____	$_____
10. Crushed Surfacing Top Course	(25/TON)	$_____	$_____
11. Crushed Surfacing Base Course	(75/TON)	$_____	$_____
12. Gravel Base	(125/TON)	$_____	$_____
13. Existing Buried Fuel Tank Work	(1/LS)	$_____	$_____

SUBTOTAL (Bid Items 1-13) $_____

SALES TAX (8.7%) (Bid Items 1-13) $_____

TOTAL (Bid Items 1-13) $_____

TOTAL in Words_____

LIST OF MANUFACTURERS

The named manufacturer for some equipment items are listed below. Contractor is to circle his selected manufacturer, when a choice is available. Contractor's Base Bid Item #1 - Pump Station #4 Upgrade is to be based on the following:

Equipment	Manufacturer
Pumps	Flygt
Generator	Cummins Onan, Kohler, or Caterpillar

EQUIPMENT ALTERNATES:

A. Furnish Pumps other than specified. Lump Sum Deduction $ - Deduction _____
Amount in Words: _____
Manufacturer & Model No. _____

B. Furnish Generator other than specified. Lump Sum Deduction $ - Deduction _____
Amount in Words: _____
Manufacturer & Model No. _____

Contractor: _____

Address: _____

Phone: _____ Date:

Contractor's State License Number: _____

By: _____ Title: _____
Signature

Name Printed _____

The bidder acknowledges receipt of the following addenda, and agrees to the conditions set forth therein, by initializing the appropriate place:

Addendum No. 1 ___ Addendum No. 2 ___ Addendum No. 3 ___ Addendum No. 4 ___

BID BOND

Deposit Statement

Herewith find a deposit in the form of certified check, or cashier's check, in the amount of
Five percent (5%) of maximum amount bid (Total for Bid items 1-13 + sales tax) in the attached Proposal.

Bid Bond

KNOW ALL MEN BY THESE PRESENTS:

That we _____, as Principal and _____, as Surety, are held firmly bound unto the City of Ferndale, Washington, as Obligee, in the penal sum of Five percent (5%) of maximum amount bid (Total for Bid items 1-13 + sales tax) in the attached Proposal, for the payment of which the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally by these presents.

The conditions of this obligation are such that if the Obligee shall make any award to the Principal for Pump Station #4 Upgrade, Ferndale, Washington, according to the terms of the Proposal or Bid made by the Principal therefore, and the Principal shall duly make and enter into a contract with the Obligee in accordance with the terms of said Proposal or Bid and award and shall give bond for the faithful performance thereof, with Surety or Sureties approved by the Obligee, or if the Principal shall, in case of failure to do so, pay and forfeit to the Obligee the penal amount of the deposit specified in the call for bids, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect and the Surety shall forthwith pay and forfeit to the Obligee, as penalty and liquidated damages, the amount of this Bond.

SIGNED, SEALED AND DATED THIS _____ DAY OF _____, 2015.

By: _____ _____
Principal Surety

NON-COLLUSION AFFIDAVIT

STATE OF WASHINGTON)
) ss.
COUNTY OF WHATCOM)

The undersigned, being duly sworn, deposes and says that the person, firm, association, co-partnership or corporation herein named, has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in the restraining of free competitive bidding in the preparation and submission of a proposal to the City of Ferndale for consideration in the award of a contract on the improvement named above.

_____
Contractor

Subscribed and sworn to before me this _____ day of _____, 2015.

Notary Public in and for the
State of Washington, residing at

CONTRACTORS QUALIFICATIONS

The below listed reference information shall be submitted with the Bid.

Bidder to list three previous wastewater facility/pump station projects with similar value ($400,000+) completed by Bidder as prime contractor. Bidder shall have successfully completed with their own equipment and personnel a minimum of three similar projects in the last six years to be considered qualified.

1. Project: _____
   (Name and Location)

   Contract Amount: _____

   Reference: _____
   (Company Name, Contact & Telephone)

2. Project: _____
   (Name and Location)

   Contract Amount: _____

   Reference: _____
   (Company Name, Contact & Telephone)

3. Project: _____
   (Name and Location)

   Contract Amount: _____

   Reference: _____
   (Company Name,
   Contact & Telephone)

Bidder shall provide the following information.

1. Resume of superintendent proposed for project.
2. List and provide references (Owner and Engineer) for any project within the last three years which have involved disputes for which the Contractor filed a claim resulting in formal dispute resolution, third-party mediation or arbitration, or a lawsuit.
3. List and provide references (Owner and Engineer) for all public works contracts in which the Contractor was sued by the Owner.

BID SUBMITTAL CHECKLIST

The bidder is advised to use the following list to assemble all forms required to be submitted with their bids. In accordance with RCW 39.30.060, bidders may submit the required documentation in two sealed packages.

PART 1 - Must be received with bid prior to the Bid Date and Time and include:

1. _____ Bid Proposal
2. _____ Bid Bond
3. _____ Non-collusion Affidavit
4. _____ Contractor Qualifications

PART 2 - Must be received prior to 1 hour after the Bid Date and Time and include:

1. _____ List of Subcontractors
2. _____ Subcontractor Qualifications

BIDS ON PUBLIC WORKS – IDENTIFICATION, SUBSTITUTION OF SUBCONTRACTORS
(RCW 39.30.060)

The prime contractor shall submit as part of the bid, or within one hour after the published bid submittal time, the names of the subcontractors with whom the bidder, if awarded the contract, will subcontract for performance of the work of: plumbing; and electrical, or to name itself for the work. The prime contract bidder shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the prime contract bidder must indicate which subcontractor will be used for which alternate. Failure of the prime contract bidder to submit as part of the bid the names of such subcontractors or to name itself to perform such work or the naming of two or more subcontractors to perform the same work shall render the prime contract bidder's bid nonresponsive and, therefore, void.

Plumbing Subcontractor: _____

Address: _____ Phone: _____

Electrical Subcontractor: _____

Address: _____ Phone: _____

SUBCONTRACTORS QUALIFICATIONS

The below listed reference information will be required 1 hour after the bid opening for all listed subcontractors of the apparent low bidder. The information may also be asked of the subcontractors of the next two low bidders at that time.

Bidder to list the following information for **three** projects for **each** of the subcontractors accounting for more than 10 percent of total bid amount. The selected projects must be of equivalent size and scope to the portion of work the subcontractor will complete on this project, and the subcontractor must have completed the work using his/her own personnel and equipment.

(This sheet shall be duplicated for each Subcontractor)

Name of Subcontractor: _____

1. Project: _____
   (Name and Location)

   Contract Amount: _____

   Reference: _____
   (Company Name, Contact & Telephone)

2. Project: _____
   (Name and Location)

   Contract Amount: _____

   Reference: _____
   (Company Name, Contact & Telephone)

3. Project: _____
   (Name and Location)

   Contract Amount: _____

   Reference: _____
   (Company Name, Contact & Telephone)

CONTRACT FORMS

NOTICE OF AWARD

To: _____.
_____.
_____.
_____.

For: City of Ferndale
Pump Station #4 Upgrade

The Owner has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids and Information for Bidders.

You are hereby notified that your BID has been ACCEPTED in accordance with your proposal for the amount of $_____.

You are required by the Information for Bidders to execute the Contract and furnish the required Bond(s) and certificates of insurance within ten (10) calendar days from the date of this Notice of Award.

If you fail to execute said Contract and furnish said Bond(s) within ten (10) days from the date of this Notice, the City will be entitled to consider all your rights arising out of the City's acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the City within 3 days of its receipt.

Dated this ._____ day of ._____, 2015

. City of Ferndale
Owner

By _____.
Title ._____

==========

ACCEPTANCE OF NOTICE:

Receipt of this NOTICE OF AWARD is hereby acknowledged:

By .
Dated this ._____day of ._____, 2015
By ._____ Printed Name
Title .

CONTRACT
FOR:
PUMP STATION #4 UPGRADE
FERNDALE, WASHINGTON

This Contract, made and entered into this ____ day of _____, 2015 by and between the City of Ferndale, hereinafter called the "Owner" and _____., hereinafter called the "Contractor".

WITNESSETH:

That in consideration of the terms and conditions contained herein and attached and made a part of this Contract, the parties hereto covenant and agree as follows:

1. The Contractor shall do all of the work and furnish all of the labor, materials, tools and equipment for the construction of the improvements and shall perform any changes in the work, all in full compliance with the contract documents entitled “Pump Station #4 Upgrade, Ferndale, Washington".

   The "Bid Proposal", "Specifications and Conditions", "Contract Forms", and the "Plans" sections contained in said contract documents are hereby referred to and by reference made a part hereof.

2. The Owner hereby promises and agrees with the Contractor to employ, and does employ the Contractor to furnish the labor, materials, tools and equipment, and to and cause to be done the above-described work, and to complete and finish the same in accordance with the said contract documents and the terms and conditions herein contained, and hereby contracts to pay for the same, according to the said contract documents, including the schedule of estimated quantities, and unit and lump sum prices in the Bid Proposal, the approximate sum of $_____, the total amount of bid, subject to the actual quantity of work performed, at the time and in the manner and upon the conditions provided for in this contract.

3. The Contractor for himself, and for his agents, successors, assigns, subcontractors and/or employees, does hereby agree to the full performance of all the covenants herein contained upon the part of the Contractor.

4. The Owner hereby appoints and the Contractor hereby accepts Wilson Engineering, Inc., hereinafter referred to as the Engineer, as the City's representative for the purpose of administering the provisions of this Contract, including the Owner's right to receive and act on all reports and documents related to this Contract, to request and receive additional information from the Contractor, to assess the general performance of the Contractor under this Contract, to determine if the contracted services are being performed in accordance with Federal, State or local laws, and to administer any other right granted to the Owner under this Contract. The Owner expressly reserves the right to terminate this Contract as provided in the contract documents, and also expressly the reserves the right to commence civil action for the enforcement of this contract.

5. This Contract contains terms and conditions agreed upon by the parties. The parties agree that there are no other understandings, oral or otherwise, regarding the subject matter of this Contract.

6. The Contractor agrees to comply with all applicable Federal, State, City or municipal standards for the licensing, certification, operation of facilities and programs, and accreditation and licensing of individuals.

7. The Contractor shall not assign or subcontract any portion of the work provided for under the terms of this Contract without obtaining prior written approval of the Engineer. All terms and conditions of this Contract shall apply to any approved subcontract or assignment related to this Contract.

8. The parties intend that an independent Contractor-Owner relationship will be created by this Contract. The Owner is interested only in the results to be achieved, the implementation of the work will lie solely with the Contractor. The Contractor will be solely and entirely responsible for its acts and for the acts of its agents, employees, servants, subcontractors, or otherwise during the performance of this Contract. In the performance of the work herein contemplated, the Contractor is an independent Contractor with regard to the performance of the details of the work; however, the components of and the results of the work contemplated herein must meet the approval of the Engineer and shall be subject to the Engineer's general rights of inspection and review to secure the satisfactory completion thereof.

9. The Contractor agrees and covenants to indemnify, defend, and save harmless, the Owner and the City of Ferndale and those persons who were, now are, or shall be duly elected or appointed officials or members of employees thereof, hereinafter referred to as the "Owner" or "City" against and from any loss, damage, costs, charge, expense, liability, claims, demands or judgments, of whatsoever kind or nature, whether to persons or to property, arising wholly or partially out of any act, action, neglect, omission, or default on the part of the Contractor, his agents, successors, assignees, subcontractors and/or employees, except only such injury or damage as shall have been caused by or resulted from the sole negligence of the City. In case any suit or cause of action shall be brought against the Owner or the City on account of any act, action, neglect, omission, or default on the part of the Contractor, his agents, successors, assignees, subcontractors and/or employees the Contractor hereby agrees and covenants to assume the defense thereof and to pay any and all costs, charges, attorney's fees and other expenses and any and all judgments that may be incurred or obtained against the City.

   In the event the Owner is required to institute legal action and/or participate in the legal action to enforce this Indemnification and Hold Harmless Clause, the Contractor agrees to pay the Owner or City's legal fees, costs and disbursements incurred in establishing the right to indemnification.

If the claim, suit, or action for injuries, death, or damages as provided for in the preceding paragraphs of this specification is caused by or results from the concurrent negligence of (a) the indemnitee or the indemnitee's agents or employees and (b) the indemnitor or the indemnitor's agents for employees the indemnity provisions provided for in the preceding paragraphs of this specification shall be valid and enforceable only to the extent of the indemnitor's negligence.

Contractor hereby specifically and expressly waives any immunity under Industrial Insurance, Title 51 RCW and acknowledges that this waiver was mutually negotiated by the parties herein. In the event of litigation between the parties to enforce the rights under this paragraph, reasonable attorney's fees shall be allowed to the prevailing party.

10. This Contract has been and shall be construed as having been made and delivered within the State of Washington, and it is mutually understood and agreed by each party hereto that this Contract shall be governed by the laws of the State of Washington, both as to interpretation and performance. Any action in law, suit and equity or judicial proceedings for the enforcement of this contract, or any provisions thereof, shall be instituted and maintained in the courts of competent jurisdiction located in City of Ferndale, Washington.

11. The failure of the Owner to insist upon strict performance of any of the covenants and agreements of this Contract or to exercise any option herein conferred in any one or more instances shall not be construed to be a waiver or relinquishment of any such, or any other covenants or agreements, but the same shall be and remain in full force and effect.

12. It is understood and agreed by the parties hereto that if any part of this agreement is determined to be illegal, the validity of the remaining portions shall be construed as if the agreement did not contain the particular illegal part.

13. No change or addition to this Contract shall be valid or binding upon either party unless such change or addition shall be in writing, executed by both parties.

14. In the event that funding from State, Federal, or other sources is withdrawn, reduced, or limited in any way after the effective date of this Agreement, and prior to its normal completion, the Owner may summarily terminate this Agreement as to the funds withdrawn, reduced, or limited notwithstanding any other termination provisions of this Agreement. If the level of funding withdrawn, reduced or limited is so great that the Owner deems that the continuation of the programs covered by this Agreement is no longer in the best interest of the City, the Owner may summarily terminate this Agreement in whole notwithstanding any other termination of this Agreement. Termination under this section shall be effective upon receipt of written notice as specified herein.

IN WITNESS WHEREOF, the Contractor has executed this instrument, on the day and year first below written and the Owner has caused this instrument to be executed by and in the name of the said County, the day and year first above written.

Executed by the Contractor this _____day of _____, 2015.

CITY OF FERNDALE:

By: _____
City Administrator / Mayor

STATE OF WASHINGTON)
) ss.
COUNTY OF WHATCOM)

On this _____ day of _____, 2015, before me personally appeared _____ to me personally known to be the person described in and who executed the above instrument and who acknowledged to me the act of signing thereof.

NOTARY PUBLIC, in and for the
State of Washington, residing at:

_____
My Commission Expires:_____

CONTRACTOR:

By: _____

Title: _____

STATE OF WASHINGTON)
) ss.
COUNTY OF WHATCOM)

On this _____ day of _____, 2015, before me personally appeared _____ to me personally known to be the person described in and who executed the above instrument and who acknowledged to me the act of signing thereof.

_____
NOTARY PUBLIC, in and for the
State of Washington, residing at:

_____
My Commission Expires:_____

PERFORMANCE BOND
to the
City of Ferndale

KNOW ALL MEN BY THESE PRESENTS, That we_____
_____ the Contractor named in the Contract hereinafter referred to as PRINCIPAL, and_____ as SURETY, are jointly and severally held and firmly bound to the City of Ferndale, hereinafter referred to as OWNER named in said Contract Pump Station #4 Upgrade, Ferndale, Washington, for the penal sum of,

_____
_____DOLLARS
($_____),
lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, assigns, administrators and successors jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that Whereas, the Principal entered into a contract with the Owner, dated the _____day of _____, 2015, for such construction work with the City of Ferndale, Washington.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform all of the provisions and fulfill all of the undertakings, covenants, terms, conditions and agreements of said contract during the period of the original contract and any extensions thereof that may be granted by the Owner, with or without notices to the surety; and during the life of any guaranty required under the contract; and shall also well and truly perform and fulfill all of the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made; notice of which modifications to the surety being hereby waived, shall indemnify and save harmless owner from all cost and damage by reason of the principal's default of failure to do so, and shall pay the State of Washington sales and use taxes, and amounts due said state pursuant to Titles 50 and 51 of the Revised Code of Washington then this obligation to be void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the above bonded parties have executed this instrument under their separate seals this _____ day of _____, 2015, the name and corporate seal of each corporate party hereto affixed, and these presents duly signed by its undersigned representatives pursuant to authority of its governing body.

Corporate Seal: _____
PRINCIPAL

ATTEST: (If Corporation)

By:_____

Title:_____

Corporate Seal: _____
SURETY

By:_____

Title:_____

PAYMENT BOND
to the
City of Ferndale

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____ , hereinafter called Principal,
(Corporation, Partnership or Individual)

and_____
(Name of Surety)

_____
(Address of surety)

hereinafter called **SURETY**, are held and firmly bound unto_____

_____
(Name of Owner)

_____
(Address of Owner)

hereinafter called **OWNER**, in the penal sum of _____Dollars, $(_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the **OWNER**, dated the _____day of _____
20___, a copy of which is hereto attached and made a part hereof for the construction of:

_____

_____

_____

_____

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, **SUBCONTRACTORS**, and corporations furnishing materials for or performing labor in the prosecution of the **WORK** provided for in such contract, and any authorized extension or modification thereof including all amounts due for materials, lubricants, oil, gasoline, coal, and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such **WORK,** and all Insurance premiums on said **WORK,** and for all labor, performed in such **WORK** whether by **SUBCONTRACTOR** or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said **SURETY** for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the **WORK** to be performed thereunder or the **SPECIFICATIONS** accompanying the same shall in any wise affect its obligation on this **BOND,** and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the **WORK** or to the **SPECIFICATIONS.**
PROVIDED, FURTHER, that no final settlement between the **OWNER** and the **CONTRACTOR** shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which
(number)

shall be deemed an original, this the _____day of _____

ATTEST:

_____
Principal

_____
(Principal) Secretary

(**SEAL)** **By** _____(s)

_____
(Address)
_____

_____
Witness as to Principal
_____
(Address)
_____ _____
(Surety)

ATTEST: **By** _____
(Attorney –in-Fact)

_____ _____
Witness as to Surety (Address)

_____ _____
(Address)

NOTE: Date of **BOND** must not be prior to date of Contract.
If **CONTRACTOR** is Partnership, all partners should execute **BOND.**

IMPORTANT: Surety companies executing **BONDS** must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the **PROJECT** is located.

CITY OF FERNDALE

RETAINAGE INVESTMENT OPTION

CONTRACTOR: _____

PROJECT NAME: _____

DATE: _____

Pursuant to Chapter 60.28 RCW, you may choose how your retainage under this contract will be held and invested. Please complete and sign this form indicating your preference. If you fail to do so, the City of Ferndale (City) will hold your retainage as described in "Current Expense", option 1 below.

_____1. Current Expense: The City will retain your money in its Current Expense Fund Account until thirty days following final acceptance of the improvement or work as completed. You will not receive interest earned on this money.

_____2. Interest Bearing Account: The City will deposit retainage checks in an interest-bearing account in a bank, mutual savings bank, or savings and loan association, not subject to withdrawal until after the final acceptance of the improvement or work as completed or until agreed to by both parties. Interest on the account will be paid to you.

BONDS AND SECURITIES ACCEPTABLE BY THE CITY OF FERNDALE:

1. Bills, certificates, notes or bonds of the United States.
2. Other obligations of the United States or its agencies.
3. Indebtedness of the Federal national Mortgage Association.
4. Time Deposits in commercial banks.

Designate below the type of investment selected:

_____
_____
_____

_____3. Bond-in-Lieu: With the consent of the City, the contractor may submit a bond for all or any portion of the amount of funds retained by the City in a form acceptable to the City and from a bonding company meeting standards established by the City, if any. Unless otherwise indicated, the contractor elects to submit a bond for the entire 5% retainage amount. Such bond and any proceeds there from shall be made subject to all claims and liens and in the same manner and priority as set forth for retained percentages in Chapter 60.28 RCW. Whenever the City accepts a bond-in-lieu of retained funds from a contractor, the contractor shall accept like bonds from any subcontractors or suppliers from which the contractor has retained funds. The contractor shall then release the funds retained from the subcontractor or supplier, to the subcontractor or supplier, within thirty days of the contractor's receipt of the retained funds from the City.

RETAINAGE INVESTMENT OPTION

Retainage is normally released 30 - 45 days after final acceptance of work by the City, or following receipt Employment Security / Department of Revenue clearance, whichever takes longer.

_____

(Contractor's Signature) Date

Title: _____

PUBLIC WORKS DEPARTMENT
2095 MAIN STREET / P.O. BOX 936
Ferndale, WA 98248
(360) 384-4006

NOTICE TO PROCEED

DATE _____

CONTACT _____

CONTRACTOR _____

ADDRESS _____

ADDRESS _____

RE: Notice to Proceed
Sewer Pump Station #4 Upgrade
City Project No. SS2014-05
Correspondence No. XXX

Dear CONTACT:

The City of Ferndale has reviewed and approved the contract bond and evidence of insurance for the aforementioned Project. Therefore, the contract has been executed.

This notice shall constitute the Notice to Proceed on the above referenced project. Contract time (90 working days) will begin on DATE. The date of completion of all work is October 23, 2015.

If you have comments, questions, or require further information, please do not hesitate to contact me at (360) 685-2377.

Sincerely,

CITY OF FERNDALE

Katy Radder
Project Manager

CC. file

SUPPLEMENTAL CONDITIONS

SUPPLEMENTAL CONDITIONS

The following supplementary conditions modify WSDOT Standard Specifications. If there are any conflicts between these Supplemental Conditions and the aforementioned Standard Specifications, these Supplemental Conditions shall take precedence.

1. DOCUMENTS INCORPORATED BY REFERENCE

The following documents are incorporated by reference, to include, but not be limited to:

- Specifications
- Proposal
- Drawings
- Contract
- WSDOT Standard Specifications Plans for Road, Bridge and Municipal Construction, 2014 Edition and Standard Plans for Road, Bridge and Municipal Construction, 2014 Edition

2. CONFLICT AND PRECEDENCE

In the event of any conflicting provisions or requirements between the component parts of the Contract Documents, the component parts shall take precedence in the following order:

1. Change Orders
2. Contract Form
3. Addenda
4. Permits and requirements from governmental agencies
5. Drawings
6. Supplemental Conditions
7. Technical Specifications
8. Ferndale City Standards
9. WSDOT Standard Drawings & Details
10. WSDOT Standard Specifications

3 CONTRACT PLANS AND SPECIFICATIONS

Five (5) sets of Contract Documents, Three (3) sets of 11”x 17”plans, Two (2) sets of 24”x 36”plans, and a CD with Contract Documents and plans in PDF will be furnished to the Contractor free of charge. Additional sets may be purchased at the advertised price per set.

4. EXAMINATION OF PLANS, SPECIFICATIONS AND SITE OF WORK

The bidder shall carefully examine the proposed work site (including material sites), and the contract documents. Submittal of a bid shall be conclusive evidence that the bidder has made these examinations and understands all requirements for the performance of the completed work.

The Contractor shall make deductions and conclusions as to the nature of the materials to be excavated, the difficulties which may arise from subsurface conditions, and of doing any other

work affected by the subsurface conditions and shall accept full responsibility. The accuracy of information furnished by the Owner and/or Engineer and/or the plans and specifications as to underground structures, foundation conditions, character of soil, position and quantity of surface and ground water, etc., is not guaranteed. Bidders must satisfy themselves by personal examination and by such other means as they desire with respect to actual conditions in regard to existing groundwater or surface structures. Unforeseen conditions shall not constitute a claim for additional payment under the terms of the contract or constitute a basis for cancellation thereof.

The Specifications do not necessarily discuss complete details of construction, work or materials, performance or installation, and do not necessarily cover construction details or other items of work or fixtures of equipment may affect any particular installation. These details must be ascertained by the Contractor and correlated to bring the parts together to a completed whole.

Where alternate methods have not been brought to the Owner's attention, it is assumed that the Contractor has figured the more costly method or methods.

5. WORK AND MATERIALS

In addition to the requirements stated in this contract document, the following shall apply:

> All work and materials under this contract shall conform to the 2014 Edition of *Standard Specifications for Road, Bridge and Municipal Construction* as prepared by Washington State Department of Transportation (WSDOT) and Washington State Chapter of American Public Works Association (APWA), and according to the instructions and recommendations of the manufacturer of the material concerned. In case of a conflict between any of the above referenced Standards, the more stringent shall apply.

References throughout the above mentioned Standard Specifications to "State" or "Owner" shall refer to the City of Ferndale.

6. OMISSIONS AND DISCREPANCIES

Upon receipt of Award of Contract, the Contractor shall carefully study and compare all drawings, specifications and other instructions and shall, prior to ordering material or performing work, report in writing to the Owner any error, inconsistency or omission not discovered at the pre-bid meeting. If during the accomplishment of the work, a discrepancy is found between the drawings and the physical condition of the locality, it shall be the Contractor's duty to inform the Owner in writing, and the Owner shall promptly verify the same. Any work done after such discovery, until authorized, will be done at the Contractor's risk.

Minor items of work or material omitted from the original plans or specifications, but clearly inferable from the information presented and which are called for by accepted good practice, shall be provided and/or performed by the Contractor as part of the original bid.

7. SURVEYS, PERMITS, REGULATIONS

The Engineer shall provide construction staking for the project. The Contractor shall provide a minimum of 3 day notice for required construction staking. The Engineer has established horizontal references and vertical grade datum for the Contractor's use. The Contractor shall be responsible for protection and preservation of the established reference points. Re-establishing the horizontal and vertical control will be done at the expense of the Contractor by Owner's surveyors.

The bidder shall be familiar with all Federal, State, and local requirements that affect the completion of work in any way (such as laws, ordinances, or rules affecting employees, subcontractors, materials, equipment or procedures). In addition, the Contractor must comply with the following Washington State Laws, including without limitation: Chapter 60.28 RCW (retainage); 39.08 RCW (bond requirements); 18.27 RCW (contractor registration); 35.22.650 RCW (equal opportunity); and 70.92 RCW (handicapped). The Owner will not consider any plea of misunderstanding or ignorance of such requirements.

The Owner will assist with coordinating City permit applications, if needed. The Contractor is to pick up the Land Disturbance permit from the City and fill-out remaining information required, prior to mobilization. However, the Contractor will be responsible for providing submittal information, as needed (including shop drawing, mechanical, and plumbing information) to the Engineer/City (if requested). Temporary permits, easements, and other Non-City permits shall be acquired by the Contractor (if needed).

8. EXISTING UTILITIES

The location of all existing utilities shown on the plans is per the best available information, and is therefore approximate only. The Owner/Engineer does not guarantee the accuracy of this information. The contractor shall take whatever measures deemed necessary to verify the accuracy of this information and the cost of such shall be incidental to the bid.

Forty-eight (48) hours prior to starting construction, the Contractor shall contact the City of Ferndale and Underground Utility Locate (if needed). All costs incurred by the Contractor in complying with the requirements of this Section shall be incidental to the entire project and shall be included in the contract price.

9. CONNECTIONS TO EXISTING MAINS (WATER MAINS AND SEWER FORCE MAINS)

Connection to existing mains is the full responsibility of the Contractor. Temporary routing of existing pipelines or services, shoring, temporary thrust blocks, extra fittings required to route the pipe over or under existing or new pipe or other utilities and all other work and materials required for making complete, permanent and workable connections are incidental to other items of work.

The Contractor shall be responsible for determining which residents will be affected by shutoffs, and will notify them in writing (with a copy provided to the City) 24 hours in advance. In addition, the Contractor shall notify private property owners or tenants, by

having a representative of the Contractor personally contact the private property owner or tenant. If the property owner or tenant is not available, the Contractor shall leave a door hanger notice indicating the commencement date of work, duration of work, the type of work being done, and the Contractor's and Engineer's phone number and address for questions and concerns. The Engineer shall be provided adequate time to review, comment, and approve the door hanger notice prior to the Contractor placing any notices.

The Contractor shall locate and verify the type of pipe, size and depth prior to making the connection. Detailed sketches and plans of the connection proposed by the Contractor shall be given to the Engineer not less than one week prior to the expected construction. The City of Ferndale shall be notified not less than two (2) working days prior to connection to existing mains.

10. SUBSURFACE CONDITIONS

The CONTRACTOR shall make deductions and conclusions as to the nature of the materials to be excavated, the difficulties which may arise from subsurface conditions, and of doing any other work affected by the subsurface conditions and shall accept full responsibility. The accuracy of information furnished by the OWNER and/or ENGINEER and/or the plans and specifications as to underground structures, foundation conditions, character of soil, position and quantity of surface and ground water, etc., is not guaranteed. Bidders must satisfy themselves by personal examination and by such other means as they desire with respect to actual conditions in regard to existing groundwater or subsurface structures. Unforeseen conditions shall not constitute a claim for additional payment under the terms of the contract or constitute a basis for cancellation thereof.

PLAN AND PROCEDURES FOR THE UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS - The following **Inadvertent Discovery Plan (IDP)** outlines procedures to follow, in accordance with state and federal laws, if archaeological materials or human remains are discovered.

Recognizing Cultural Resources: A cultural resource discovery could be prehistoric or historic. Examples include:

- An accumulation of shell, burned rocks, or other food related materials,
- Bones or small pieces of bone,
- An area of charcoal or very dark stained soil with artifacts,
- Stone tools or waste flakes (i.e. an arrowhead, or stone chips),
- Clusters of tin cans or bottles, logging or agricultural equipment that appears to be older than 50 years,
- Buried railroad tracks, decking, or other industrial materials.

When in doubt, assume the material is a cultural resource.

<u>On-Site Responsibilities:</u>

<u>STEP 1: STOP WORK.</u> If any City employee, Contractor or Subcontractor believes that he or she has uncovered a cultural resource at any point in the project, all work adjacent to the discovery must stop. The discovery location should be secured at all times.

STEP 2: NOTIFY CITY PROJECT MANAGEMENT TEAM AND CR/ENV/NR CONTACTS. Contact the City Project Manager, Wilson Engineering LLC, and Drayton Archaeological Research.

Contacts:

City Project Manager:
Name: Katy Radder
Phone: (360) 685-2377
Email: KatyRadder@cityofferndale.org

Wilson Engineering LLC
Name: Jeff Christner, P.E.
Phone: (360) 733-6100 ex 252
Email: jgc@wilsonengineering.com

Cultural/Environmental/Natural (CR/ENV/NR) Program Manager:
Name: Garth Baldwin, Drayton Archaeological Research
Phone: (360) 739-3921
Email: garth@draytonarchaeology.com

The Project Manager or the CR/ENV/NR will make all other calls and notifications.
If human remains are encountered, treat them with dignity and respect at all times. Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection in place and to shield them from being photographed. **Call the Ferndale Police Department at 360-384-3390** (Do not call 911 or speak with the media).

11. TRAFFIC CONTROL

Traffic shall be maintained in accordance with WSDOT Section 1-07.23 of the WSDOT Standard Specifications and Manual of Uniform Traffic Control Devices. The Contractor shall not close any roadway without first obtaining authorization from the city. The cost for all necessary traffic control by the Contractor shall be incidental to the entire project and shall be included in the contract price.

12. SUBCONTRACTING

The Contractor shall perform work amounting to a minimum of 50% percent of the Awarded Contract Price using his own personnel and equipment. All subcontracting shall be in conformance with WSDOT Section 1-08.1 of the WSDOT Standard Specifications.

13. PRE-CONSTRUCTION CONFERENCE

A Pre-Construction conference shall be held at a time and place fixed by the Owner which will be within two weeks from the date of notification of award of contract. At a minimum the Contractor's project manager and field superintendent are required to attend. Sub-contractors, suppliers and others interested are encouraged to attend.

14. HOURS OF WORK

The Contractor shall schedule operations so that the work will be performed during the hours of 7AM to 5PM Monday through Friday, excluding holidays. A normal 40 hour Monday

through Friday work week (4 – 10hr or 5 – 8hr days) is intended. The Contractor shall compensate the City $80 per hour for each hour over 40 hours per week worked to pay for additional inspection time. The Contractor shall obtain prior approval from the City for overtime hours and schedules.

15. COMPLETION DATE

The contracted work is to be completed by no later than **October 23, 2015.** The Contractor will be limited to **85 working days (17 weeks)** on-site work. In addition, the new 4-ft diameter manhole AND 8-ft diameter wet well construction work shall be scheduled between **July 1 and September 30, 2015.** The Contractor shall plan accordingly to meet these completion requirements.

16. SCHEDULE OF CONSTRUCTION & VALUES

Within 10 working days of receiving the notice to proceed, the contractor shall furnish to the City a Schedule of Values. In addition, the Contractor shall furnish a Schedule of Construction at the Pre-Construction Meeting. The Schedule shall identify the project start and finish dates with a detailed breakdown of the proposed order of work and completion dates for major phases of the work. The schedule shall be developed by a critical path method. Time required for testing, backfiring, inspections, ordering, punch lists, etc. shall be incorporated into the schedule (although they do not necessarily need to be specifically identified).

17. RETAINAGE

The owner will deduct from the partial pay estimate a retainage of five percent (5%). Upon completion of all work, specified training, final inspection, and acceptance by Owner, the amount retained under the Contract will be paid within thirty (30) days following final acceptance by Owner and receipt by the Owner of the following:

- State Department of Labor and Industries Release
- Washington State Department of Revenue Release
- Washington State Employment Security Department Release
- Contractor and Subcontractors Affidavit of Wages Paid

The retainage will not be released if any claim has been filed on the project.

18. LIQUIDATED DAMAGES

Liquidated damages will be assessed in accordance with WSDOT 1-08.9 for each working day beyond the Contracted completion date listed above.

19. PHYSICAL COMPLETION FOR THE PUMP STATION UPGRADE

Substantial completion of the Pump station Upgrade shall be defined as follows, with no exceptions:

> The new pump station shall be able to be put to beneficial use. This shall include installation of the new 8’ diameter wet well, new 6’ diameter wet well covers/risers, piping, pumps, valves, instrumentation, controls, new backup generator, SCADA

adjustments, misc. work items, and most of the clean up complete. In essence, the entire pump station facility will be operable and complete per WSDOT 1-01.3 Completion Dates.

20. PAYMENT TO CONTRACTOR

At least five (5) working days before the end of the month, the Contractor shall submit to the Engineer an itemized application for payment, supported by receipt or other vouchers, showing payments for materials and labor, payments to sub-contractors, and such other evidence of the Contractor's right to payment as the Engineer may direct. The Owner's progress payment shall be made approximately 30 days after the date of submittal.

The owner will deduct from the partial pay estimate a retainage as defined above. Upon completion of all work, final inspection, and acceptance by Owner, the amount retained under the Contract will be paid at the expiration of the thirty (30) day period following final acceptance by owner provided the following conditions are met:

A. Releases have been obtained from the State Department of Labor and Industries, the State of Washington Employment Security Department, the Washington State Department of Revenue, and all other departments and agencies having jurisdiction over the activities of the Contractor.
B. No claims, as provided by law, have been filed against the retained percentage.
C. Affidavit of Wages Paid is on file with the Owner for the Contractor and all Subcontractors.
D. All contract work is complete in every respect, including operations and maintenance manuals, as-built drawings, etc.

21. INDEMNIFICATION

The Contractor agrees to protect, indemnify, and hold harmless the Owner, Engineer and their employees, agents, and staff, from any and all claims, liabilities, damages, expenses, or rights of action, directly or indirectly attributable to the Contractor's activities in connection with this contract, except for the sole negligence of the Owner or Engineer as outlined in Section WSDOT 1-07.14.

22. RECORD DRAWINGS

Before receiving payment for more than 90% of the work or declaring physical completion of the work, the Contractor will provide the Owner with accurate record information of all construction activity for the entire project (red line drawing on a full size print). This red line drawing shall include, but not be limited to, any changes to the project and the exact location of all constructed utilities and any other existing utilities discovered during construction that are not identified on existing record information. The red line drawing shall be based on accurate field measurements tied to project benchmarks. The Owner will use this information to prepare Record Drawings. The cost for furnishing this record information shall be considered incidental to the entire project and shall be included in the contract price.

23. BARRIER REQUIREMENTS

During construction, the Contractor shall at all times maintain satisfactory and substantial temporary fencing, railing, barricades or steel plates at all openings, obstructions or other hazards. All such barriers shall have warning signs or lights as necessary for safety. Safe access to and protection of the construction site and the Contractor's records shall be maintained at all times.

24. CONTROL OF WORK

The presence or absence of an Inspector at the job site will be at the sole discretion of the Owner and such presence, or absence, of an Inspector will not relieve the Contractor of his responsibility to obtain the construction results specified in the Contract Documents. The Owner, inspector and engineer do not purport to be Safety Engineers and are not engaged in that capacity and shall have neither authority nor responsibility to enforce construction safety laws, rules, regulations, procedures or the safety of persons on and about the construction site. Any personal assistance which an Inspector may give the Contractor will not be construed as the basis of any assumption of responsibility in any manner, financial or otherwise, by the Owner, Inspector, or the Engineer. The Inspector is on site to insure the project is completed in accordance with all plans and specification, to insure the Owner is getting what is required. He is not there to do the Contractor's scheduling or contact his subs or deliver messages.

25. BLASTING

Blasting is not anticipated and will not be permitted without expressed written consent of the Owner. If blasting is permitted, contractor is responsible for obtaining all necessary permits and insurance.

26. INSURANCE

The Contractor shall take out and maintain during the life of this contract Public Liability Insurance for bodily injury and property damage liability including without limitation, coverage for explosion, blasting, collapse and destruction of underground utilities (X.C.U.) and contingent liability, including products and completed operations and blanket contractual liability, as shall protect the Contractor, the Owner and the Engineer. The Contractor shall have the Owner and the Engineer specifically added as additional named insured in said policies (on Form B), all at no cost to the Owner or the Engineer. The above insurance shall cover the Owner, the Engineer, Contractor and Subcontractors for claims or damages for bodily injury, including wrongful death, as well as other claims for property damage which may arise from operations under this contract whether such operations be by themselves or by any subcontractor or anyone directly or indirectly employed by either of them. The Contractor agrees, in addition, to indemnify and save harmless the Owner and Engineer, either or both, from all suits, claims, demands, judgements, and attorneys fees, expenses or losses occasioned by the performance of this Contract by the Contractor or Subcontractor or persons working directly or indirectly for the Contractor or Subcontractor, or on account of or in consequence of any act or omission of any such person, including but not limited to neglect in safeguarding the work, or failure to conform with the safety standards for construction work adopted by the Safety Division of the Department of Labor and Industry of the State of Washington.

The amount of such insurance shall be as follows:

Bodily injury liability insurance in an amount not less than $1,000,000.00 for injuries, including wrongful death, to any one person and subject to the same limit for each person, in an amount not less than $2,000,000.00 on account of any one occurrence, and property damage liability insurance in an amount not less than $1,000,000.00 for each occurrence. Builders Risk (All Risk Insurance) coverage equal to project bid amount.

The Contractor shall not cause any policy to be canceled or permit it to lapse, and all policies shall include a clause to the effect that the policy or certificate shall not be subject to cancellation or to a reduction in the required limits of liability or amounts of insurance or any other material change until notice has been mailed to the Engineer and Owner stating when, not less than thirty (30) days thereafter, such cancellation or reduction or change shall be effective. In the event notice of cancellation is received by the Owner, the Contractor shall immediately obtain other comparable insurance acceptable to the Owner and provide proof thereof to the Owner. In the event the Contractor is unable to obtain and provide such insurance, the Contractor shall immediately cease all work on the project, save and except that which is necessary to secure the site and prevent injury.

All certificates of insurance, authenticated by the proper officer of the insurer, shall state in particular those insured, the extent of the insurance, the location and operations to which the insurance applies, the expiration date, and the above-mentioned notice of cancellation clause.

Provided, however, the Owner may accept insurance covering a Subcontractor in character and amounts less than the standard requirements set forth under this subsection where such standard requirements appear excessive because of the character or extent of the work to be performed by such subcontractor.

A Certificate of Insurance evidencing coverage and a copy of the endorsement naming the Owner and Engineer as additional insured must be submitted to the Engineer prior to the commencement of the Contract in accordance with WSDOT Section 1-03.3.

The following endorsement for additional insured shall be included in all applicable policies and on the Certificate of Insurance:

The Owner and Engineer are additional named insured for all coverages provided by the policy of insurance and shall be fully and completely protected from all claims and risks by this policy and for any and every injury, death, damage, and/or loss of any sort whatsoever, including consequential damages, sustained by any person, organization or corporation in connection with any activity performed by the Contractor or any subcontractors or by anyone directly or indirectly by virtue of the provisions of that contract between the (Owner name), as Owner and (Contractor's name), entitled (Project Title), dated (date).

The coverages provided by this policy to the Owner or any other named insured shall not be terminated, reduced, or otherwise modified in any respect without providing at least 30 days prior written notice by certified mail to the Owner and other additional named insured. The coverages provided by this policy are primary to any insurance maintained by the Owner.

27. CHANGES

The Owner reserves the right to make changes in the work within the general scope of the Contract Documents at any time during the progress of the work. The Contractor shall perform all work in accordance with the changes specified by the Owner.

Changes required by the Owner may include but are not limited to:

(a) Deletion of any portion of the work.
(b) Increases or decreases in quantities.
(c) Changes in specifications and/or designs.
(d) Method or manner of performance of the work.
(e) Addition of any new work.
(f) Acceleration or delay in the performance of the work.

The Owner shall have the option of paying for such changes by one or more of the following methods:

(1) by the lump sum or unit contract prices set forth in the Proposal;
(2) by equitable adjustment mutually agreed upon by the Contractor and the Owner; or
(3) by Force Account in accordance with WSDOT Section 1-09.6

In the case that the Contractor and the Owner are unable to agree on the amount of equitable adjustment, the Owner will unilaterally determine the amount to be paid for the change in accordance with WSDOT Section 1-09.4. The Owner's decision concerning such amount to be paid shall be final as provided in WSDOT Section 1-05.1.

Any and all administrative costs associated with change orders shall be considered to be part of the Contractor's overhead for the work as bid and not a direct cost of the change. Such administrative costs shall include, but not be limited to, costs of defining changed work, determining estimated cost of changed work, preparing proposals for change orders and negotiation of the method and amount of compensation for changed work.

The compensation for each change shall include all direct and indirect costs including, but not limited to, costs of impacts on related and indirect operations and of delay or acceleration of other work resulting from the change. Failure of the Contractor to identify all direct and indirect costs at the time of negotiation of compensation for each changed shall preclude subsequent claim, after formal execution of a change order, by the Contractor for any additional costs associated with the change.

No payment for extra work or any other change in the contract will be made unless the extra work or change has been authorized by the Owner prior to start of the extra work by the Contractor.

For (a) Deletion of any portion of the work, above, the following requirements shall apply:

No payment will be made for items which are deleted from the contract and not performed. No payment will be made for any anticipated profits which would have been earned on work deleted. Payment for costs incurred by the Contractor prior to the deletion of the work shall include and be limited to actual documented costs of field labor, equipment and materials and shall not cover and include overhead as defined in WSDOT Section 1-09.6.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of cancellation of the work will be either purchased from the Contractor by the Owner at the actual cost and shall become property of the Owner or the Owner will reimburse the Contractor for his actual costs connected with returning these materials to the suppliers.

For (b) Increases or decreases in quantities, above, the following requirements apply:

Payment for all bid items shall be at the unit prices bid, regardless of the actual final quantities of the bid items incorporated into the work and regardless of any increase or decrease from the quantities designated in the Schedule of Contract Prices.

No extra or additional payment will be made for any increase in quantity of any bid item. No extra or additional payment will be made for any decrease in quantity of any bid item. No payment will be made for any anticipated profits which would have been earned on deleted quantities.

For (c) Changes in specifications and/or designs; (d) Addition of any new work; and (e) Acceleration or delay in the performance of the work above, the following requirements shall apply:

If the Engineer determines that the above changes cause an increase or decrease in the Contractor's cost of performance of that portion of the work associated with the change and/or an increase or decrease in the contract time required for performance of the work, the increase or decrease in compensation and/or contract time will be determined by agreement of the parties.

28. INCREASED OR DECREASED QUANTITIES

The Contractor shall not purchase or place orders for full quantities of materials until the work has advanced to a state permitting the determination of the exact quantities required. The original bid item quantities designated on the Proposal and other estimates of quantities of materials furnished by the Engineer shall be considered as approximate and not indicative of the actual quantities required. The Owner will not be responsible for any materials purchased in excess of actual requirements and will not be responsible for any increased costs or extra expense that the Contractor may have on account or materials or work not being ordered at some earlier date.

29. SALES TAX

The work is within the City of Ferndale. The Contractor shall correctly reference on payments of sales tax to the Washington Department of Revenue Ferndale's tax code.

30. GUARANTEES

Except where special longer warranties are required, the Contractor shall guarantee all materials and workmanship for a period of one year from the date of Substantial Completion of the project.

Neither final acceptance by the Owner nor partial and final payment nor any provision in the Contract Documents shall relieve the Contractor of responsibility for faulty materials or workmanship.

If, prior to the expiration of one year after the date of the City's acceptance of all work or such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any work is found to be defective or not in compliance with the Contract Documents, the Contractor shall promptly, without cost to Owner, either correct such work, or, if it has been rejected by Owner, remove and replace it with acceptable work. If the Contractor does not promptly comply with the notification issued by the Owner for correction of defective and/or non-complying work and have the defect completely repaired within 30 calendar days, the Owner may have the work corrected or removed and replaced and all direct and indirect costs of such removal and replacement, including costs of all professional services, shall be paid by Contractor.

The guarantee shall apply to all elements and parts of the work, regardless of knowledge by the Owner, engineer and inspector(s) of defects or deficiencies and regardless of failure of the Owner, Engineer and/or inspector(s) to inform the Contractor of known or suspected defects or deficiencies prior to Substantial Completion of the work by the Owner.

All subcontractor's, manufacturers', and suppliers' warranties and guarantees, express or implied, for any part of the work, materials and equipment shall be deemed obtained and shall be enforced by the Contractor for the benefit of the Owner without the necessity of formal transfer or assignment thereof. Warranties and guarantees by subcontractors,

manufacturers, and suppliers shall begin on and extend for one year after the date of Substantial Completion of all work.

All work (including materials and equipment) repaired or replaced in accordance with this Section shall be guaranteed for a period of one year after the date of City's acceptance of the repair/replacement work.

TECHNICAL SPECIFICATIONS

SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. The work covered by the Contract Documents consists of furnishing all labor, equipment and materials necessary for the construction of the Pump Station Upgrade as shown on the plans and specified herein.

B. Contractor shall furnish all labor, tools, equipment and materials needed. In addition, the Contractor shall provide shoring, bracing, sheeting, cribbing, falsework, pumping, dewatering, drainage, forms, and all material as required or necessary to excavate, backfill, grade, construct, lay, erect, install, test, and clean up the site. The work shall consist of, in general, the following:

1. Removal of existing generator, buried fuel storage tank, and associated appurtenances.
2. Construction of new 12" waterline.
3. Construction of new 8' diameter pump station wet well, including dewatering work (as needed).
4. Installation of protective 8' diameter wet well interior coating system.
5. Installation of new pumps, discharge piping, supports, level sensor equipment, and misc. accessories.
6. **Construction of new clean out/bypass pumping port and valving:** Contractor to submit plan for review and approval 2 weeks (min.) prior to installation of the new bypass pumping port. At a minimum, plan to include the following provisions:
   A. Understanding that roughly 30 minutes of sewage storage is available in the existing pump station wet well, and sewage spills are not acceptable and sewage containment is crucial.
   B. Commitment to provide a 5,500 gallon Pumper (Vactor) Truck on-site for sewage removal purposes, as needed, during bypass pumping port cut-in. Potential contact = Vac-Tank Western Services, Inc. 360-354-4339.
   C. Plan to haul sewage to the Ferndale WWTP. Coordinate with City. In addition, Pumper Truck is to be cleaned prior to hauling to eliminate issues from potential contaminants such as grit and septic tank sludge.
   D. Plan to have a spool piece of pipe with restraints on-hand for temporary connection at cut-in location, if needed, due to construction delays and urgent need to turn pump station back "ON".
7. **Bypass Pumping Operation during removal of existing pumps/valves/piping and installation of new flow meter/valves/piping in vicinity of both existing 6' diameter wet wells:**

Contractor to submit Bypass Pump Around Plan for review and approval 2 weeks (min.) prior to bypass pumping operation. At a minimum, plan to include the following provisions:

A. Understanding that sewage spills are not acceptable and sewage containment is crucial. In addition, bypass pumping operation time is to be minimized as much as possible.
B. Commitment to have an operator on-site 24 hours a day during bypass pump operations.
C. Commitment to be able to provide a 5,500 gallon Pumper (Vactor) Truck on-site for sewage removal purposes within 30 minutes if bypass pumping operation is not working satisfactorily. Potential contact = Vac-Tank Western Services, Inc. 360-354-4339.
D. Plan to haul sewage to the Ferndale WWTP, if needed. Coordinate with City. In addition, Pumper Truck is to be cleaned prior to hauling to eliminate issues from potential contaminants such as grit and septic tank sludge.
E. Contractor is to plan to provide temporary bypass pumping from new 8' diameter wet well to the proposed bypass port with temporary 6" diameter piping, during entire pump/valve switch-over period. Back-up pumping system to be sized for the current peak flow (750 gpm at 55' TDH) with one duty pump and one standby pump. Each pump to be equally sized for 750 gpm demand (minimum), and to be configured with high water level alarm lights, and high water level alarm call outs to all interested parties. Contractor to provide all equipment information, with submittal (including pump make/model/capacity, pipe size/length, controls/alarms, etc.)
F. See Section 01300 – Submittals. Switch-over from existing pumps to new pumps to be performed as quickly & efficiently as possible. Contractor to plan accordingly.

8. Construction of new 4' diameter manhole and 15" gravity sewer pipe to new wet well. Maintain existing 12" sewer and route flow into new 15" sewer after decommissioning existing pump station.
9. Installation of new concrete, grout, vault drain piping, and other misc items for the two existing 6' diameter vaults.
10. Installation of new 6' diameter wet well risers, top slabs, and hatches.
11. Removal of existing and installation of new electrical controls, support brackets/unistruts, back-up generator, automatic transfer switch, and instrumentation.
12. Grading, paving, gravel surfacing, fencing, hydroseeding, and other site work improvements.
13. Other related work necessary to complete the project as shown on the plans or described herein.

1.02 WORK AND RESPONSIBILITIES

A. Unless otherwise indicated, work and responsibilities include, but are not limited to the following:
   1. Providing and paying for labor, materials, equipment, tools, machines, facilities, and services necessary for execution and completion of work.
   2. Paying required taxes.
   3. Giving required notices.
   4. Enforcing strict discipline and good order among employees.
   5. Using new materials, except as noted.
   6. Maintaining required egress and other requirements in accordance with governing Codes and Ordinances throughout the work.
   7. Obtaining and paying for required permits, fees and notices, see General Conditions.

1.03 SEQUENCE/PHASING

A. Contractor shall comply with the sequence of operation shown on the plans or discussed in the specifications.

B. These documents are not to be interpreted implicitly or explicitly as definition of procedure and sequence of operations. Order as to procedure and sequence of operations are Contractor options, consistent with contract documents and as approved by Owner.

C. Site Work: Proposed stockpiling areas must be approved by the Owner.

D. Summary: The foregoing outline of the primary elements of construction within the project is intended as a summary of that work only. The work outlined is <u>not</u> to be regarded by the Contractor as an exhaustive definition of the scope of work.

1.04 COOPERATION AND COORDINATION

A. Contractor is responsible for coordinating and scheduling work of subcontractors to expedite progress of the Project.

B. Subcontractor Instructions: Subcontractors to become familiar with Conditions of the Contract and the work of other Sections related to their own work.

C. Project Coordination and Scheduling Control: Responsibility for coordination and close adherence to time schedules rests solely with the General Contractor who shall maintain coordination and scheduling control at all times.

D. Each separate contractor and each subcontractor responsible to the General Contractor shall cooperate diligently with the General Contractor in the execution

of their work so as to cause no delay in the completion of the Project. This responsibility includes the completion of all work in a timely manner and all items of equipment connected and fully operating at the time of Substantial Completion. Each separate contractor and each subcontractor shall diligently comply with the following requirements:

1. Inform other trades of requirements at proper time to prevent delay or revisions.
2. Be informed on the requirements of other trades and check own work for conflicts with the work of other trades.
3. Insure delivery of materials and performance of work on coordinated schedule with other trades.
4. Contractor is to ensure the subcontractors and equipment suppliers are responsible for compatibility and completeness of the installation and operation of the equipment in their respective Specification Sections including conformance with code requirements. If power, piping, conduit, or other work required for complete installation is not provided by others to equipment location or is not adequate for complete installation, the Contractor shall be responsible for providing the necessary connections.

E. Notification and Correction of Defective Work: Before starting a section of work, each contractor and subcontractor shall carefully examine all preparatory work that has been executed to receive his work. Check carefully, by whatever means required, to ensure that the work and adjacent, related work will finish to proper contours, planes, and levels. Promptly notify the Contractor of any defects or imperfections in preparatory work which will in any way affect satisfactory completion of the work. Under no condition shall a section of work proceed prior to preparatory work having been completed, cured, dried, or otherwise made satisfactory to receive such related work. Correction of defective work or underlying defects shall be the responsibility of the Contractor.

F. Intent of Drawings: The work of each contractor and subcontractor shall conform to the intent of the contract drawings. Drawings showing work of other trades are partly diagrammatic and do not intend to show in detail all features of work. Each contractor shall carefully review and compare related drawings and shall thoroughly understand the building conditions affecting their work. All changes required in the work caused by failure to do so shall be at no expense to the Owner.

G. Interferences and Right-Of-Way: Make proper provisions to minimize interferences. Where conflicts occur, gravity drainage improvements have right-of-way over mechanical and electrical work; electrical work has right-of-way over landscaping work. Submit conflicts which cannot be resolved by right-of-way to Engineer for instructions.

H. Cooperate and coordinate with any other separate Contractors under Contract with the Owner.

1.05 CONSTRUCTION STAGING AREA

A. Coordinate staging areas with the City.

1.06 EXISTING UTILITIES

A. Utilities of record are shown on the Drawings insofar as possible to do so. These, however are shown for convenience only and the Owner and his representatives assume no responsibility for improper locations or failure to show utility locations on the Drawings. At Contractor's expense, immediately repair utilities damaged during construction.

1.07 MISCELLANEOUS

A. Items include, but are not limited to:
   1. Contractor to provide on-site access to City crews at all times, in particular for City maintenance activities.
   2. Maintaining a pedestrian and vehicular access to and around existing projects.
   3. Not unreasonably encumbering site with materials or equipment.
   4. Assuming full responsibility for protection and safekeeping of products stored on premises.
   5. Moving any stored products interfering with any other Contractors.
   6. Obtaining and paying for use of additional storage or work areas needed for operations.
   7. Restoration of any damage to existing improvements adjacent to work site.
   8. Moving and replacing items incidental to completion of the work including mailboxes, fences, small shrubs and tress, street signs, yard decorations, etc.

*****END OF SECTION*****

SECTION 01060 - REGULATORY REQUIREMENTS

PART I - GENERAL

1.01 SECTION INCLUDES

A. As required by General Conditions: "Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work." Except where otherwise expressly required by applicable Laws and regulations, neither OWNER nor ENGINEER will be responsible for monitoring CONTRACTOR'S compliance with any Laws and Regulations. Contractor is responsible for keeping the Owner, Labor & Industries and other authorities completely informed of any changes in the work in a timely manner, and is responsible for informing them of any changes in the work which may affect codes and laws. This includes contract modifications, amendments, additions, shop drawings, and the like, current as of Project Manual date.

B. Make any and all adjustments and modifications as required to conform to ordinances, and regulations.

C. Referenced codes establish minimum requirement levels. Where provisions of various codes or standards conflict, the more stringent provisions govern. Promptly submit to Engineer written notice of observed contract document variations from legal requirements.

D. Compliance requirements include, but are not limited to following:

1. Uniform Building Code and Related Standards, most recent edition, published by the International Conference of Building Officials.
2. State Rules and Regulations for Barrier Free Design/WAC 51-10.
3. The Americans with Disabilities Act (ADA) "Accessibility Guidelines for Buildings and Facilities."
4. Department of Labor and Industries Regulations.
5. Electrical Work:
    a. Underwriters' Laboratories (UL).
    b. National Electrical Manufacturers' Association (NEMA).
    c. NFPA, National Electric Code (NEC), National Electric Safety Code, and above electrical listings, as applicable.
    d. State Electrical Construction Code.
6. Environmental Requirements: All work to be performed in compliance with relevant statutes and regulations dealing with prevention of environmental pollution and preservation of public natural resources.
7. 2012 Standard Specifications for Road and Bridge Construction, Washington State Department of Transportation, (WSDOT).

8. Standard Specifications for Municipal Public Works Construction, Washington State Chapter, American Public Works Association.

1.02 MISCELLANEOUS EXPLANATIONS/INTENT

A. A number of Specified Items Required: Wherever in these Specifications an article, device, or piece of equipment is referred to in the singular number, the reference applies to as many such articles as are shown on the Drawings or required to complete the installation.

B. Drawings/Diagrammatic:
1. Drawings are in part diagrammatic and do not necessarily show complete details of construction, work or materials, performance or installation. And they do not necessarily show how construction details, other items or work, fixtures, and equipment may affect any particular installation. Contractor is required to ascertain and correlate the work to bring the parts together into a satisfactory and completed whole.
2. Furnish and install work not covered under any heading, Section, branch, class or trade of the Project Manual, but shown on or reasonably inferable from the Drawings. This includes all work necessary to produce the intended results.

C. Wording of these Specifications: These Specifications are of the abbreviated or streamlined type and may include incomplete sentences.
1. Words such as "shall", "the Contractor shall", "shall be", and similar mandatory phrases, are required to be supplied by inference in the same manner as they are in a note on the Drawings.
2. Provide all items, articles, materials, and operations listed, including all labor, materials, equipment and incidentals, required for their completion.

D. Tense, Gender, Singular, Plural: Present tense words include future tense. Words in masculine gender include feminine and neuter genders. Words in the singular include plural. Plural words include singular.

E. All, Entire, and the Like: For brevity throughout the documents, these words may be omitted. Read their implications into all work.

F. Specifications by Reference: Any material specified by reference or number, symbol or title of a specified standard, such as commercial standard, ANSI and ASTM documents, Federal Specifications, trade association standard, or the like, shall comply with the following:
1. The latest revision requirements thereof, and any amendment or supplement thereto, in effect on Bid date or date of Owner-Contractor Agreement when there are no bids.

G. Dimensions and Measurements on Drawings: Dimensions govern. Do not scale. Contractor is to check all dimensions in the field and verify them with respect to adjacent or incorporated work. Large scale drawings take precedence over plans, elevations, and cross sections.

H. First Class Workmanship: First Class Workmanship is expected.
   1. Prior to installing any item or material, verify that receiving surfaces are plumb, level, true to line, and straight to the degree necessary to achieve tolerances specified or required. Perform without extra cost all shimmering, blocking, grinding, or patching required to make such surfaces plumb, level, true to line, and straight.
   2. Take care in attention to details and fitting at intersections and junctures of materials. All joints are to be tight, straight, even, and smooth.

I. Presence of Engineer/Owner: Do not misconstrue presence of this person or any of his representatives at the site as assuring compliance with Contract Documents.

*****END OF SECTION*****

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Project meetings will be held to accomplish the following:

1. Coordinate the work of the project and resolve any conflicts or construction problems.
2. Establish a sound working relationship between the Contractor, Owner, and Engineer.
3. Establish sound working procedures.
4. Review job progress and quality of work.
5. Expedite the work to completion within the scheduled time limit.

B. Representatives of Contractors, subcontractors, and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.02 RELATED SECTIONS:

A. Related work specified elsewhere:

1. Pre-Bid Conference: Bid Procedures
2. Summary of Work: Instructions to Bidders
3. Submittals: Section 01300

1.03 PRECONSTRUCTION MEETING

A. The pre-construction meeting will be scheduled within the time frame identified in the General Conditions. The Owner will notify the Contractor as to the time and place of the meeting.

B. Present at the meeting shall be a representative of the Owner, the Engineer, the Contractor, Project Superintendent, and major subcontractors.

C. The Contractor must be prepared for a thorough discussion and review, as well as revisions which may be deemed necessary in the opinion of the Owner, of the following:

1. General project information
2. Responsibilities of all involved parties
3. Content of the contract
4. Contractor's schedule
5. Schedule of construction
6. Penalties and Liquidated Damages

7. Subcontracts
8. Status of Owner furnished materials
9. Change order procedures
10. Staking of work
11. Project inspection
12. Acceptance of work
13. Labor standards requirements
14. Rights-of-way and easements
15. Placement of project signs and posters
16. Handling of disputes
17. Schedule of Values
18. Additional issues as required.

1.04 PROGRESS MEETINGS

A. Unless otherwise required, progress meetings will be held by the Owner on a weekly basis at a location near the site. Present at these meetings shall be the Contractor, subcontractors and suppliers as required, the Owner and other interested parties, i.e., material suppliers, public utility, etc.

B. The Contractor must be prepared for a thorough discussion and review, as well as revisions which may be deemed necessary in the opinion of the Owner, of the following:
   1. Review work since previous meeting.
   2. Make field observations and address any conflicts or problems.
   3. Review material delivery schedules
   4. Review work progress including any issues that may impact project schedule.
   5. Review submittal schedule.
   6. Maintenance, testing and quality standards.
   7. Review any proposed changes.
   8. Review pay requests and procedures.

C. The Owner shall preside over progress meetings and shall be responsible for taking minutes, recording all significant proceedings and decisions. Copies of minutes shall be distributed within one week after the meeting.

1.05 SCHEDULE

A. The Contractor shall develop and submit an estimated construction progress schedule for the contracted work. The schedule shall be submitted to the Owner at the Pre-Construction Meeting.

B. Schedule shall be a horizontal bar chart or critical path diagram depicting the first day of each week and sized to be legible and permit notations and future revisions.

C. Schedule shall be arranged chronologically by the start date of each item, and consider the following:
   1. The estimated construction progress schedule shall:
      a. Show complete sequence of construction by activity.
      b. Show start and stop dates of each major construction element.
      c. Show projected percent completion for each major construction element at the first of each month.
   2. Through construction, the Contractor shall record progress of each major construction element.
   3. Revisions shall show changes relative to previously submitted schedules and updated projections of progress and completion.

D. The schedule and all subsequent revisions shall be kept at the Contractor's field office with copies provided to the Engineer and Owner.

*****END OF SECTION*****

SECTION 01300 - SUBMITTALS

1.1 GENERAL

A. Related Requirements Specified Elsewhere:
   1. General Conditions: Section 00700
   2. Contract Closeout: Section 01700

B. Description of Section:
   1. Summarize, but not necessarily a complete listing, submittals required of the Conditions of the Contract and the General Requirements.
   2. General procedures for specification submittals. Specific requirements for submittals are included in the individual sections.

1.2 GENERAL SUBMITTAL REQUIREMENTS

A. Identification of Submittals
   1. Identify each submittal with Project title and number; clearly define location of submittal in the project and/or its location in the Contract Documents.
   2. It is the responsibility of the Contractor to coordinate the work of the various trades involved with the work under this agreement. Contractor shall check all submittals by his subcontractors and mark them with his approval prior to submittal.

1.3 SUBMITTALS - GENERAL

A. General

   The listing of submittals is given generally as a checklist for the Contractor's convenience. The Engineer reserves the right to add to this list. This list is not an exhaustive listing of applicable laws, provisions of any law, or requirements of these Contract Documents.

B. With Bid
   1. Qualifications of Contractor and subcontractors
   2. Bid Bond
   3. Completed Bid Form with all unit costs, signed
   4. Proposal

C. With Award
   1. As required by financing agency
   2. Performance & Payment Bonds
   3. Liability Insurance
   4. Agreement

D. 10 Days after Agreement (or earlier)
   1. Construction Schedule (to be available at Pre-Construction Meeting also)
   2. Schedule of Shop Drawing Submission

E. Prior to Commencing Work
   1. Statement of Intent to Pay Prevailing Wage
   2. Final Project Schedule

F. 2 Weeks Prior to Temporary Bypass Cut-In Work
   1. Bypass Cut-In Plan (See 01010 – Summary of Work)
G. 2 Weeks Prior to Bypass Pump Around Period
   1. Bypass Pump Around Plan (See 01010 – Summary of Work)
H. 2 Weeks Prior to Dewatering Activities
   1. Dewatering Plan (See 02370 – Erosion and Sedimentation Control)
I. Monthly, After Commencing Construction
   1. Application for Payment
J. Applications for Payment
   1. Contractor affidavit stating payment of subcontractors
   2. Subcontractor statements of being paid
   3. Paid receipts and inventories of materials stored
   4. Updated Construction Schedule
   5. O & M Manuals prior to application for payment exceeding 90% of Total
K. Final Application for Payment
   1. Record Drawings information
L. Release of Retained Funds
   1. Record and related contract closeout documents
   2. Affidavit of Payment (wages, subcontractors, taxes, etc.)

1.4 SUBMITTAL OF SHOP DRAWINGS & SAMPLES

A. General
   1. Refer to the General Provisions. Provide one (1) PDF copy of each submittal.
   2. Submission of shop drawings and samples shall be accompanied by one original and one copy of a transmittal letter containing project name, Contractor's name, number of drawings and samples, titles and other pertinent data.
   3. Contractor shall maintain a complete material list and file of Engineer reviewed submittals at the project site for use as reference by subcontractors, Owner, Engineer and other interested parties.

B. Shop Drawings
   1. General:
      a. Shop drawings shall be the same size as the Contract Drawings. A 5" x 5" space shall be provided in the lower right-hand corner of the shop drawings for the review stamp.
      b. Drawings shall clearly indicated the correct configurations and relative sizes, materials, metal gages, etc. of the various components and the proposed methods of fabrication, required clearances, supports and any other pertinent data.

2. Submittals:
   a. Submit PDF copies of each shop drawing for General, Mechanical and Electrical work, including fabrication, erection, layout and setting drawings and other drawings.
   b. Engineer will review for conformance to design.
   c. Contractor is responsible for obtaining and distributing required prints of shop drawings to his subcontractors and material suppliers before and after final review by the Engineer.
   d. Submittals shall be for equipment and materials which meet or exceed the specifications. Submittals shall be, in the sole judgement of the Engineer, acceptable by the second submittal. The Contractor will be responsible for the cost of review, as solely determined by the Engineer, for all reviews after the second review. Such costs will be deducted from the Contract Amount.

C. Samples
   1. Form of Submittal:
      When samples are specified to be submitted, furnish two samples, except as noted herein, of sufficient size to indicate general visual effect or as otherwise specified in the specifications, and in as nearly the form in which the material will appear on the project as practicable; i.e., submit paint on samples of actual material for which they are specified as a finish; one set of reviewed and selected samples will be retained at the Engineer's office.

   2. Review:
      a. The Owner will check submitted samples against file samples and project requirements, will make final selection of colors and finishes from samples, and will approve sample for application on the project in conformance with the Specifications.
      b. Should a submitted sample not be in conformance with the specifications, resubmit sample which conforms with the requirements of Contract Documents.

D. Catalog Cuts, Data & Brochures
   1. Where indicated in the Specifications, catalog cuts and similar data will be accepted in lieu of shop drawings, provided they contain required information and are clearly printed. Submit manufacturer's descriptive data including catalog sheets for materials, equipment and fixtures, showing dimension, performance characteristics and capacities, wiring diagrams and controls, schedules, and other pertinent information as required.

E. Submittal of Product Certificates
   1. Where manufacturer certificates are specified to be furnished attesting to conformance with specification requirements, submit certificates in triplicate prior to acceptance of the Work.

F. Test Reports

1. Submittal is classified either as "shop drawing" or "product data", depending upon whether the report is uniquely prepared for the project or a standard publication of regular product or workmanship control testing at the point of production (respectively).
2. Refer to individual sections of the Specifications for specific requirements; furnish 3 copies when required.

G. Warranties

1. Provide warranties, guarantees and/or maintenance agreements where the Specifications require a period longer than the Contractor warranty period.

H. Operation & Maintenance Data

Furnish instructions and data on materials and equipment installed in the work in accordance with requirements of the technical provisions of the specifications and assemble as specified below. These manuals shall be submitted prior to application for payment exceeding 90% of the total contract amount.

1. Provide five (5) sets of Operation and Maintenance Data. Each set shall be bound in separate commercial quality three-ring binders with durable and cleanable plastic covers. The words "Operation and Maintenance Manual (or Instruction)" along with the type of equipment covered shall be typed or neatly printed on the cover.
2. Each set shall be complete with an index and, as a minimum, cover the following items:
   a. Name, location and telephone number of manufacturer and product's model number.
   b. Name, location and telephone number of nearest supplier and spare parts warehouse.
   c. Start-up procedures and normal operating characteristics and instruction.
   d. Regulation, control, shut-down and emergency instructions.
   e. Recommended preventative maintenance procedures including a lubrication schedule with recommended lubricants.
   f. Trouble-shooting guide.
   g. Complete nomenclature and commercial number of all parts including exploded views of each assembly.
   h. List of recommended spare parts.
   i. Complete as-built elementary wiring and outline diagrams.
   j. Statements of warranty or guarantee.
3. Operation and Maintenance Manuals shall be submitted in at least draft form for Engineer's review with Shop Drawings, Catalog Cuts and other

material submittal data. Final drafts, incorporating Engineer's comments, shall be submitted prior to Contractor's application of payment for 90 percent or more of the work.

4. Contractor shall maintain a complete file of all Engineer reviewed Operation and Maintenance Manuals at the project site for use as a reference by interested parties.

*****END OF SECTION*****

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Inspection and testing laboratory qualifications, duties and responsibilities.

B. Contractor's quality control requirements.

1.02 RELATED SECTIONS

A. Related Requirements Specified Elsewhere:

1. Section 01300 - Submittals
2. Section 01600 - Materials and Equipment
3. Section 01700 - Contract Closeout

1.03 APPLICABLE PUBLICATIONS

A. ASTM E329: Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as used in Construction.

B. WSDOT and ASHTO: Applicable sections that pertain to compaction testing for subgrade, base and top course, and asphalt testing.

C. Washington State Building Code and Uniform Building Code Standards.

1.04 DEFINITIONS

A. Factory Tests: Tests made on various products and component parts prior to shipment to the job site, including but not limited to such items as transformers, boilers, air conditioning equipment, electrical equipment, and precast concrete.

B. Field Tests: Tests or analyses made at, or in the vicinity of the job site in connection with the actual construction.

C. Product: The term "product" includes the plural thereof, and means a type or a category of manufactured goods, constructions, installations and natural and processed materials or those associated services whose characterizations, classification or functional performances determination is specified by standards.

D. Person: The term "person" means associations, companies, corporations, educational institutions, firms, government agencies, at the Federal, State and Local level, partnerships, and societies, as well as divisions thereof, and individuals.

E. Testing Laboratory: The term "testing laboratory" means and "person", as defined above, whose functions include testing, analyzing, or inspecting "products" as defined above, and/or evaluating the designs or specifications of such "products" according to the requirements of applicable standards.

F. Certified Test Reports: Certified test reports are reports of tests signed by a qualified professional attesting that tests were performed in accordance with the test method specified, that the test results reported are accurate, and that items tested either meet or fail to meet the stated minimum requirements. These test reports include those performed by Factory Mutual, Underwriter's Laboratories, Inc., and others.

G. Certified Inspection Reports: Certified inspection reports are those signed by approved inspectors attesting that the items inspected meet the specification requirements other than any exceptions included in the report.

H. Manufacturer's Certificate of Conformance or Compliance: A certificate signed by an authorized manufacturer's official attesting that the material or equipment delivered meets the specification requirements.

1.05 QUALITY CONTROL REQUIREMENTS

A. All work under the contract shall be inspected and tested as specified herein. The Contractor shall maintain records of all inspections and tests. Approvals shall be obtained before delivery of materials to the project site.

B. The Contractor is responsible for scheduling and coordinating all field testing (cast-in-place concrete, earthwork/trench compaction, pipe pressure testing, potable pipe disinfection, etc.). The contractor is responsible for notifying Owner and coordinating test requests as discussed elsewhere in these documents. The contractor is responsible for the costs of any repeat tests required where failed test results were obtained.

C. If required, contractor responsibility for quality control testing shall be as follows:
   1. Factory Tests: Unless otherwise specified, the Contractor will arrange and pay for factory tests when required by the contract documents.
   2. Factory Inspection: Unless otherwise specified, the Contractor will arrange and pay for factory inspection when required by the contract documents.
   3. Field Inspection and Tests by the Contractor: Unless otherwise specified, the Contractor shall furnish all equipment, instruments, qualified personnel, and facilities necessary to inspect all work and perform all tests when required by the contract documents. All inspections and tests performed and test results shall be promptly submitted to the Owner.
   4. Approval of Testing Laboratories: All laboratory work under this contract shall be performed by a laboratory approved by the Owner.

D. Laboratory Reports: Reports shall cite the contract requirements, the test or analysis procedures used, the actual test results, and include a statement that the item tested or analyzed conforms or fails to conform to the specifications requirements. All test reports shall be signed by a representative of the testing laboratory authorized to sign

certified test reports. The Contractor shall arrange for immediate and direct delivery of the signed original of all reports, certifications, and other documentation to the Owner.

E. Repeated Tests and Inspections: The Contractor shall repeat tests and inspections after each failed test until passing test results are obtained. The retesting and reinspections shall be performed at no additional cost to the Owner and the Contractor shall reimburse the Owner for their or their representative's, time and expenses due to the failed test results.

1.06 CONTRACTOR'S RESPONSIBILITY

A. Access. Furnish free access to various parts of the work and assist testing inspection personnel in performance of their duties at no additional cost to the Owner.

B. Concealed Work. When directed by the Owner, the Contractor shall open for inspection any part of the work which has been concealed. Should the Contractor refuse or neglect such a request, the Owner may employ any other person to open up the same or do so himself. If any part of the work has been concealed in violation of the Owner's instruction or, if on being opened, it is found not to be in accordance with the terms of the Contract Documents the expense of opening and recovering, whether done by the Contractor or not, shall be charged to the Contractor. If the work has been concealed but not in violation of the Owner's instructions and is found to be in accordance with the terms of the Contract Documents the actual necessary expense of opening and recovering is done by the Contractor it shall be considered as extra work and paid for accordingly.

C. Notices. The Contractor shall notify the Owner not less than 48 hours, unless otherwise noted, before work requiring inspection is started. The Contractor shall schedule portions of the work requiring inspection and testing, so that the agency's time on the project is continuous and as brief as possible.

1.07 CONSTRUCTION SURVEILLANCE BY OWNER

A. Appointment. The Owner may appoint an on-site representative for surveillance of any and all portions of the work. Such surveillance may extend to any or all parts of the work, and to the preparation or manufacture of materials to be used.

B. Authority of On-Site Representative. On-site representative is not authorized to revoke, alter, enlarge or relax the provisions of the Contract Documents, and is placed on the work site to keep the Owner informed as to the progress of the work and the manner in which it is being done. He may also call the attention of the Contractor to any deviations from the plans or specifications. Failure of the Owner or his representative to call the attention of the Contractor to faulty work or deviation from the Contract Documents shall not constitute acceptance of said work. The

representative is not authorized to approve or accept any portions of the work or to issue instructions contrary to the Contract Documents. The representative will exercise only such additional authority as may be specially delegated to him by the Owner, notice of which will be given in writing to the Contractor.

1.08 DEFECTIVE WORK

A. Remove and replace any work found defective or not complying with requirements of Contract Documents, at no additional cost to Owner. Work will be checked as it progresses, but failure to detect any defective work or materials shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Owner for final acceptance.

*****END OF SECTION*****

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION OF SECTION

A. Temporary utilities and miscellaneous temporary facilities required during construction.

B. Providing Temporary Facilities:
   1. Provide temporary construction, devices, equipment, power and convenience utilities for use, convenience and safety of personnel engaged in the work of the contract.
   2. Provide temporary utilities and access during construction to existing home owners at all times.

1.02 RELATED SECTIONS

A. Related Requirements Specified Elsewhere:
   1. Section 01700 - Contract Closeout:
   2. Section 02370 - Erosion Control

1.03 REGULATIONS

A. Health and safety: Conform with "Safety Standards for Construction Work, Chapter 296-155 WAC" by State of Washington Department of Labor and Industries.

B. Construction codes: Comply with regulatory construction codes as applicable.

C. Washington State Department of Health: Comply with all applicable codes for temporary sewer and water service.

1.04 TEMPORARY FACILITIES

A. Temporary Electrical Light & Power:
   1. Provide all temporary lighting and power, including pole or poles, transformer if required, for construction purposes.
   2. Provide temporary connections to closest utility source.
   3. Provide all required extension cords, lighting outlets and power outlets (grounding type), lamps, and other required equipment and accessories necessary only for adequate temporary lighting and power for construction purposes.
   4. Remove temporary lighting and power equipment and their connections at completion of the work or sooner if approved or directed.

B. Water for Construction Purposes (if needed):
   1. The Contractor is responsible for obtaining and providing water as required for the work.
   2. If agreed, Contractor to make temporary connections with metered connection with backflow preventers to utility piping as required for the work and provide meter, piping, hoses, nozzles and other accessories required.
   3. At completion, or before as directed, disconnect temporary connections and piping and remove from site.
   4. Provide secure system to prevent unauthorized use during Contractor's absence.

C. Sanitary Facilities
   1. Contractor shall provide sanitary facilities in accordance with WISHA and Health Department requirements.

D. Drinking water:
   1. Provide from proven safe source, for all those connected with the work in accordance with WISHA and Health Department requirements.
   2. Pipe and transport in such manner as to keep it clean and fresh; serve in single containers or provide sanitary drinking fountains.

E. Residential Access
   1. Provide access to residential homes at all times.
   2. Provide access to the area at all times for emergency and service vehicles.

F. City Accesss
   1. Provide access to City Operations Staff at all times, in particular if repairs are needed.

1.05 MISCELLANEOUS PROVISIONS

A. Cleaning Up:
   1. General: The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. Clean up work areas as required at the end of each day's work.

   2. Trash removal: Remove all trash and debris from site and dispose of at Contractor's expense. Allow no debris, broken or open cartons, or other refuse to collect in the project or around it; allow no inflammable or hazardous materials to be stored on the site without approved protection precautions and procedures.

   3. Street and parking area cleaning: Immediately clean all spilled material which results from the work of this contract and waste hauling operations; use motorized equipment and hand labor as required. Remove from streets, driveways or parking

areas in time to prevent such materials from affecting traffic or clogging street drainage system; clean any drains contaminated.

B. Noise Control: During the period of construction, provide satisfactory means, as approved by the Owner, of controlling noise originating from construction work and equipment.

C. Dust Control: During the period of construction, provide satisfactory means of controlling dust and dirt, including application of water to control dust but not cause erosion.

D. Temporary Erosion and Sedimentation Control: The Contractor shall provide sedimentation and erosion control.

1.06 DEBRIS CONTROL

A. Cleaning during construction: Maintain all areas free of extraneous debris.

B. Prevent accumulation of debris at construction site, storage and parking areas, and along access roads and haul routes.

C. Keep storm sewers free of debris or extraneous materials.

D. Offsite Cleanup: Prevent any leaking of materials from the vehicle used to haul offsite and clean haul routes *daily*.

1.07 POLLUTION CONTROL

A. Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere. Allow no discharge of noxious substances from construction operations.

B. Provide equipment and personnel; perform emergency measures required to contain any spillages. Remove contaminated soils and liquids.

C. Take special measures to prevent harmful substances from entering public waters.

D. Provide systems for control of atmospheric pollutants in accordance with Federal/State/Local published rules and regulations.

*****END OF SECTION*****

SECTION 01600 - MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION OF SECTION

A. General requirements for providing transportation, handling, storage, and protection of materials and equipment.

B. Contractor's options in selection of products and manufacturers, and procedures for consideration of proposed substitutions.

C. All material and equipment incorporated into the work:
   1. Shall be new, free from defects and of equal or superior quality as specified herein and on the drawings.
   2. Shall be the products of established manufacturers regularly engaged in the fabrication of such equipment.
   3. Shall comply with the size, type and quality specified and shall be designed for use in the particular application.
   4. Shall be designed, fabricated and assembled in accordance with standard engineering and shop practice.
   5. Shall be complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and for intended use and effect.

1.02 RELATED SECTIONS

A. Related Requirements Specified Elsewhere:
   3. Section 01300 - Submittals:
   4. Section 01400 - Quality Control:

1.03 MANUFACTURER'S INSTRUCTIONS

A. Installation of all materials and equipment shall comply with manufacturer's printed instructions. The Contractor shall have the responsibility to distribute copies of such instructions to all parties involved in the installation, including the Owner. One complete set of instructions shall be maintained on the job site during installation and until completion.

B. All materials and equipment shall be handled, installed, connected, cleaned, conditioned and adjusted in strict accordance with such instructions and in conformance with the specified requirements. The Owner should be immediately notified should job conditions or specified requirements conflict with the manufacturer's instructions.

SECTION 01600 - MATERIAL AND EQUIPMENT

1.04 TRANSPORTATION AND HANDLING

A. All materials and equipment shall be transported and handled in such a manner as to prevent any damage.

B. Deliveries of products shall be in accordance with construction schedules as to cause no delay in the work or to conflict with work and conditions at the site.

C. Products shall be delivered in the manufacturer's original containers with identifying labels intact and legible. Where materials are specified to conform to ASTM, Federal or other reference specifications, the materials shall be delivered to the site bearing the manufacturer's label stating that the materials meet the requirement of such referenced specifications.

D. Products shall be inspected immediately upon delivery to assure compliance with specified requirements and approved submittals and that products are properly protected and undamaged.

E. The Contractor shall provide personnel and equipment to receive and unload products delivered to the site. No products shall be delivered to the site unless such forces are available.

1.05 STORAGE AND PROTECTION

A. All products shall be stored in strict accordance with the manufacturer's instructions, with seals and labels intact and legible.

B. All products shall be arranged in a neat order and protected from damage from the weather, traffic and construction operations. Easy access for periodic inspection shall be provided.

1.06 PRODUCTS AND SUBSTITUTIONS

A. Products:
   1. Where available, provide standard products of types which have been produced and used previously and successfully on other projects and in similar application.
   2. Where additional amounts of a product, by nature of its application, are likely to be needed by Owner at a later date for maintenance and repair or replacement work, provide a standard, domestically produced product which is likely to be available to Owner at such later date.
   3. For Products specified only by a reference standard, the Contractor may select any product meeting that standard.

4. Where the make or name of a material or equipment is specified in the written documents or on the drawings, it is to establish a quality standard in that particular field of manufacture. Requests for substitutions may be submitted only if the specification states “or equal”, otherwise the named material or equipment must be supplied. Requests for substitutions of materials of other makes or names must be submitted to the Owner and must receive favorable written response from the Owner prior to ordering, furnishing or installing the proposed substitution item.

B. Requests for Substitutions:
   1. For a period of thirty (30) days after the Contract Date, the Owner will consider written requests from the Contractor for substitution of Products.
   2. Requests for each Product substitution shall be submitted separately. Requests for substitutions will be received and considered when revisions to contract documents are not required, and the product or material is in keeping with the general intent of the Contract Documents.
   3. A request for substitution by the Contractor constitutes a representation that the Contractor:
      a. Will provide the same warranties or bonds for the substituted item as for the Product specified.
      b. Will coordinate the installation of an accepted substitution into the work and make all other changes as required to make the work complete in all respects with no increase to the contract price.
   4. Submit six (6) copies of requests for substitutions, fully identified for Product or method being replaced by substitution, including related specification section and drawing number(s), and fully documented to show compliance with requirements for substitutions.
   5. Include product data/drawings, description of methods, samples where applicable, Contractor's detailed comparison of significant qualities between specified item and proposed substitution, statement of effect on construction time and coordination with other affected work, cost information or proposal, and Contractor's statement to the effect that proposed substitution will result in overall work equal-to-or-better-than work originally indicated.
   6. The contractor agrees to pay all Engineering costs accruing as a result of checking and/or redesign due to substitutions. These costs will be charged to the Contractor and will be considered incidental to the contract price.

C. Owner's Review
   1. Within two weeks of receipt of request, or within one week of receipt of requested additional information or documentation (whichever is later), the Owner will notify the Contractor of either his acceptance or his rejection of the proposed substitution. Rejection will include statement of the reasons for

rejection (non-compliance with the requirements for requested substitutions, or other reasons as detailed.)

*****END OF SECTION*****

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 GENERAL

A. Related Requirements Specified Elsewhere:
   1. Section 01300 – Submittals

B. Description of Section:
   1. Specific administrative procedures, and closeout submittals at substantial completion and at final acceptance of the work.
   2. Requirements for record documents and start-up procedures.
   3. The listing of procedures and submittals is given generally as a checklist for the Contractor's convenience. The Owner reserves the right to add to this list. This list is not an exhaustive listing of either all applicable laws or of the provisions of any law.
   4. The Contractor shall comply with all contract requirements prior to contract closeout. Specific administrative procedures, and closeout submittals at substantial completion and at final acceptance of the work.

1.02 SUBSTANTIAL COMPLETION

A. Prior to submitting for substantial completion, the Contractor shall have:
   1. Delivered tools, spare parts, extra stocks of materials, and similar physical items to Owner.
   2. Made final changeover of locks and transmit keys to Owner.
   3. Completed start-up testing of systems, and performed instructions for Owner’s operating/maintenance personnel. Discontinued (or change over) and removed from project site temporary facilities and services.
   4. Provide record information to the owner of the as-constructed facilities.
   5. Completed final cleaning up requirements, including but not limited to, touch-up of marred surfaces, grading, installation of handrails, etc.

B. When the Contractor considers the work to be substantially complete, he shall submit to the Owner:
   1. Written notice that the work, or designated portion thereof, is substantially complete. (The term "substantially complete" shall be defined as in accordance with the WSDOT General Specifications and also as defined herein).
   2. List of items to be completed or corrected and reasons for being incomplete. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents.
   3. Progress payment request coincident with or first following date claimed, show either 100% completion for portion of work claimed as "substantially complete", or list incomplete items and the value of the incomplete work.

4. Submit statement showing accounting of changes to the Contract Sum.
5. Specific warranties, workmanship/maintenance bonds, maintenance agreements, final certification and similar documents.
6. Obtain and submit releases enabling Owner's full and unrestricted use of the work and access to services and utilities, including (where required) certificate of occupancy permits, operating certificates, and similar releases.
7. Record (as-built) drawings, project manual, operation and maintenance manuals, and similar final record information.

C. Upon receipt of Contractor's request, the Owner will either proceed with inspection or advise Contractor of prerequisites not fulfilled. Following initial inspection, Owner will either prepare letter of substantial completion, or advise Contractor of work which must be performed prior to issuance of letter; and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form the initial "punch list" for final acceptance.

D. When the Engineer, on the basis of an inspection, concurs that the work is substantially complete, he will:
1. Prepare and deliver to the Contractor a letter of Substantial Completion accompanied by the Contractor's list of items to be completed or corrected. The letter of Substantial Completion shall state the responsibilities of the Contractor for security, maintenance, damages to the work and insurance and shall fix the time within which the Contractor shall complete the items listed therein. Warranties and guarantees required by the Contract Documents shall commence on the Date of final acceptance by the City.
2. The letter of Substantial Completion is submitted to the Contractor for their written acceptance of their responsibilities as stated therein.

1.03 FINAL INSPECTION

A. When the Contractor considers the work to be complete, he shall submit written notice to the Owner that the work has been completed and inspected in compliance with the Contract Documents including punchlist items, and equipment and systems have been tested and are operational; and requesting a contract completion inspection.

B. When the Engineer, on the basis of an inspection, concurs that the work is acceptable under the Contract Documents, he will notify the Contractor in writing and request the Contractor to provide remaining submittals.

C. Should the Engineer determine that the work is not acceptable under the Contract Documents:
1. The Engineer will promptly notify the Contractor in writing giving the reasons therefor.

2. The Contractor shall remedy the deficiencies in the work and submit a new written notice for final inspection to the Owner.

1.04 FINAL PAYMENT

A. When the Contractor has satisfied all requirements of this section and all other conditions of the Contract Documents, the Contractor may submit a final Application for Payment. Should the Owner determine the Work acceptable under the Contract Documents and the Agreement fully performed, he will promptly issue a final Certificate for Payment stating that to the best of his knowledge, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance due the Contractor, and as noted in the final certificate, is due and payable.

B. The accumulated retainage shall not be paid until the Contractor submits to the Owner:
1. Affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work for which the Owner might in any way be responsible, have been paid or otherwise settled.
2. Release of Lien. One will be required from each lien holder who has duly filed a notice of claim with the Owner. If any liens remain unsatisfied after the expiration of the statutory lien period, the Contractor shall refund the Owner all amounts that the Owner may be compelled to pay in discharging such lien including all costs and reasonable attorney's fees.
3. State Department of Revenue form that all taxes have been paid.
4. State Department of Labor and Industry affidavit of wages paid.
5. State Department of Employment Security Contractor release.

C. The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:
1. Unsettled liens or disputes.
2. Faulty or defective work appearing after Substantial Completion under the project guarantee and equipment warranty period.
3. Failure of the work to comply with the requirements of the Contract Documents.
4. Terms of any special warranties required by the Contract Documents.

The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment.

1.05 FIELD TESTS AND ADJUSTMENTS

A. All mechanical and electrical equipment, as required under the separate section headings, shall be tested by the Contractor to the satisfaction of the Engineer before

any facility is put into operation. Tests shall be as specified herein and shall be made to determine whether the equipment has been properly assembled, aligned and connected. Any changes, adjustments or replacements required to make the equipment operate as specified shall be performed by the Contractor as part of the Work.

B. At least 14 days before the time allowed in the construction schedule for commencing testing and start-up procedures, the Contractor shall submit to the Engineer details of the procedure proposed for testing and start-up of all mechanical and electrical equipment, except when such procedures have been covered in the specifications.

C. The Contractor's testing and start-up procedures shall include detailed descriptions of all preoperational electrical, mechanical and instrumentation testing work. Each control device, item of mechanical, electrical and instrumentation equipment, and all control circuits shall be considered in the testing procedures, which shall be designed, in a stepwise, logical sequence to ensure that all equipment has been properly serviced, aligned, connected, calibrated and adjusted prior to operation. The Contractor is advised that failure to observe these precautions may place the acceptability of the subject equipment in question, and he may either be required to demonstrate that the equipment has not been damaged, or replace it as determined by the Engineer. Testing procedures shall be designed to duplicate as nearly as possible all conditions of operations, and shall be carefully selected to ensure that the equipment is not damaged. Once the testing procedures have been accepted by the Engineer, the Contractor shall produce checkout, alignment and adjustment, and calibration sign-off forms for each item of equipment, which shall be used in the field by the Contractor and the Engineer jointly, to ensure that each item has been properly installed and tested. All testing must be performed in the presence of the Engineer.

D. During the testing of the mechanical, instrumentation and electrical equipment, the Contractor shall make available, as necessary, representatives of the manufacturers of all the various pieces of equipment, or other qualified persons, who shall instruct the Owner's personnel in the operation and care thereof. Instructions shall include written step-by-step operation and trouble-shooting procedures with a complete description of all necessary test equipment and all protective device settings. Upon completion of testing, the manufacturer's representative shall provide the Engineer with a letter stating that the specific piece of equipment has been properly installed and tested and will satisfy the requirements of the Contract Documents.

1.06 RECORD (AS-BUILT) DRAWING INFORMATION

A. During the construction period, the Contractor shall maintain a complete set of prints for the sole purpose of maintaining a day-by-day record of installed information. This information shall include, but not limited to: the size and location of all concealed or underground piping, conduit, and ductwork; all approved deviations from the specifications and drawings; the location of any visible objects relocated due to

interference's or requested relocations submitted and approved on shop drawings. Such relocations shall be dimensioned.

B. Addenda, bulletins, field orders, and change orders shall be posted and referenced in the record set of prints.

1.07 RECORD PROJECT MANUALS

A. Maintain one copy of the Contract Documents, including addenda, change orders and similar modifications issued in printed form during construction, and mark-up variations (of substance) in actual work in comparison with text of the Project Manual and modifications as issued.

B. Give particular attention to substitutions, selection of options, and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Not related record drawing information and product data, where applicable.

1.09 MISCELLANEOUS RECORD SUBMITTALS

Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to date(s) of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to Engineer for Owner's records.

1.10 FINAL CLEAN-UP

A. At the completion of the work, the Contractor shall leave the premises in a neat and unobstructed condition, ready for Owner occupancy. The buildings shall be left in a dust-free condition and all equipment and materials in perfect repair and adjustment.

B. After all trades have completed their work and just before final acceptance and occupancy by owner, thoroughly clean all surfaces of project. Clean lighting fixtures and electrical equipment, including washing and polishing lenses inside and out. Wash and polish all exposed metal surfaces. Broom clean exterior paved areas and rake clear other surfaces of the grounds. All waste building materials, pipe, etc. shall be removed from the site and disposed of.

*****END OF SECTION*****

SECTION 02050 - DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Work Specified Elsewhere
   1. Summary of Work: Section 01010

B. Description of System: The work covered by this section includes the furnishing of all labor, equipment, and materials necessary for the demolition, removal, rehabilitation and equipment salvage of all construction as specified herein and as shown on the drawings.

1.02 JOB CONDITIONS

A. The major items of demolition work are at the existing pump station # 4, as described herein.

B. All removed equipment, materials, and debris, unless otherwise noted or requested by the Owner, shall become the property of the Contractor. The Contractor shall deliver all items to be salvaged (as directed by the City), to the storage area in City's WWTP. **The items that the City has selected for retention include the following:** existing standby generator & control panel, existing pumps & controls, pressure transducer, float switches, and misc. valving/piping as directed by City.

C. Protection: Ensure the safe passage of persons around the area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and people and livestock.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.01 DEMOLITION

A. Pollution Controls:
   1. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level.
   2. Comply with governing regulations pertaining to environmental protection.

B. Removal Requirements:

Provide complete removal and disposal of all structures identified for demolition. All pipes connected to abandoned structures are to be plugged/grouted in an approved manner, preventing any potential water and/or sewer leaks. Salvage items as directed by City officials.

C. Sequence of Demolition:
Proposed wastewater equipment is be purchased and on-hand, prior to removal of specified structures. Contractor is to coordinate removal/demolition with City operations (a minimum of 1 week) prior to all removal/demolition work.

D. Structures to be Removed (demolished):
1. Existing generator. Salvage items as directed by City.
2. Existing control panel for the generator. Salvage items as directed by City.
3. Existing buried diesel fuel tank for the generator.
4. Existing pumps/valves/piping/accessories for the pump station and valve vault. Salvage items as directed by City.
5. Existing concrete covers and hatches for the 6’ diameter wet well and valve vault. Salvage items as directed by City.
6. Existing concrete slabs, walkway, and asphalt pavement as shown on plans.
7. See electrical drawings and specifications for additional demolition items/requirements.

3.02 DISPOSAL OF DEMOLISHED MATERIALS

A. General. Remove from the site debris, rubbish, and other materials resulting from demolition operations. Burning of removed materials from demolished structures will not be permitted on the site. Comply with all federal, state and local regulations regarding hauling and disposal.

B. Removal. Transport materials removed from demolished structures and dispose of at a legal disposal site.

*****END OF SECTION*****

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of Work: The work covered by this section consists of excavating, hauling and disposal of excavated material, backfilling, placing, compacting and final site grading as specified herein and as shown on the drawings.

B. Related Documents:

- Appendix A: *Limited Geotechnical Engineering Evaluation, Ferndale Pump Station #4 Improvements, GeoTest Services, Inc.* (GeoTest, June 19, 2013). This report summarizes the exploration of soil and groundwater conditions underlying the site.

1.02 QUALITY ASSURANCE

All field inspections and tests shall be coordinated and called in by the Contractor; however, **compaction tests and concrete strength tests will be paid by the City**. Testing lab is to be instructed to forward invoices to the City. In addition, the Contractor shall allow the Owner/Engineer's representative to perform additional QA/QC testing and shall make right to the satisfaction of the Engineer all work found to be deficient in meeting the specifications. If the subgrade or fills which have been placed are below the specified density, additional compaction and testing will be required until satisfactory results are obtained. QA/QC testing and inspection by the Owner/Engineer does not relieve the Contractor from the responsibility to provide all adequate quality control measures and all testing to ensure the quality of his own work.

For non-structural fill in landscape areas, the Contractor may re-use suitable on site material. Compaction of non-structural (and non-vehicle) landscape areas to be compacted to 85% density (minimum). If Contractor desires to use on-site material for structural fill, the Contractor must first use an independent soils testing lab to measure ASTM D-1557 Methods A through D dry density. The Contractor will perform compaction tests (ASTM 1557) to determine material moisture/density curves. All material samples will be taken at the time and location as agreed by the Engineer and Contractor. The Contractor shall give the Owner/Engineer ample time to perform additional QA/QC testing (if desired) of Contractor stockpiled onsite soil tested – at least 5 working days prior to installation of any embankment or backfill using onsite soils.

The Contractor will coordinate and schedule one in place density measurement per every 100 LF of roadway and per every 1,000 square feet of native subgrade prepared and compacted prior to placement of Structural Fill. The Contractor will perform one in place density measurement per every 500 cubic yards of Structural Fill placed. The Engineer may increase the frequency if the properties of the soils being placed change or the equipment or procedures used by the Contractor for compacting the soil change. In place density will be measured using

ASTM D-1556 or ASTM D2922 and D3017 (nuclear density) test methods. The Contractor shall give the Owner/Engineer ample time to perform additional QA/QC testing (if desired) of the subgrade – at least 24 hours advance notice and a minimum of 4 hours for completion of testing after compaction is completed on 100 LF of roadway or 1,000 square feet of native subgrade. The Contractor shall give the Owner/Engineer ample time to perform additional QA/QC structural fill testing (if desired) – at least 24 hours advance notice and a minimum of 4 hours for completion of testing after compaction is completed on a lift.

The Contractor shall pay for any additional testing that he deems necessary to provide quality assurance for his work or to corroborate or protest the Owner's test results.

1.03 JOB CONDITIONS

A. Existing Conditions:

1. The Contractor shall examine the site before commencing work and shall make his own deductions and conclusions as to the nature of materials to be encountered and difficulties anticipated.

2. Data results of a subsurface investigation of the site and soil conditions are included in the GeoTest Geotechnical Report (Appendix A). In addition, the Contractor is encouraged to visually inspect soil conditions at the site.

   The Owner makes no representation as to the correctness of the information contained in the geotechnical report. Any use made of the report by the Contractor is at his sole risk. Contractors shall make whatever investigations as are necessary to determine what measures are necessary to successfully complete the work in accordance with the Contract. The Contractor shall include in the Contract price all work necessary to perform the tasks required to complete the Work as indicated on the Plans and specified herein: including, but not limited to, sheeting, shoring, dewatering, stabilizing slopes, and any other work of temporary nature not a part of the permanent finished structure, lines, and grade.

B. Subsurface Conditions

   Groundwater is anticipated, and dewatering measures will be required for construction activities. Contractor to plan accordingly.

   Boulders, buried or otherwise, may be found in the project area, and boulder excavation is considered incidental, if needed.

PART 2 - PRODUCTS

2.01 GEOTEXTILES

A. NON-WOVEN GEOTEXTILE WRAP. Mirafi 160N, Evergreen TG 600, Contech C-60NW, or equal.

2.02 UNSUITABLE FILL MATERIAL

A. Unsuitable materials shall be those defined as containing volcanic ash, topsoil, vegetation matter, sludge, peat, organic clays and silts, sod, mulch, rubbish, and materials which are excessively fine or moist not allowing adequate compaction. The on-site soils [Predominantly Granular Sandy Silts (Bellingham Drift)] are not suitable for reuse as structural fill materials due to the elevated moisture and silt content of the soil. However, the native soils may be used in non-structural areas when placed at or near optimum moisture contents as determined by ASTM D1557. The Contractor is to be prepared to address over-optimum moisture content soils.

2.03 STRUCTURAL FILL MATERIAL

A. See section 2.04 PROCESSED MATERIAL. All structural fill is to be imported material per WSDOT specifications.

2.04 PROCESSED MATERIAL.

A. CRUSHED SURFACING TOP COURSE. Per WSDOT 9-03.9(3).

B. GRAVEL BASE. Per WSDOT 9-03.10.

C. QUARRY SPALLS. Per WSDOT 9-13.6. Unless otherwise noted on the plans.

D. GRAVEL BACKFILL FOR FOUNDATIONS. Per WSDOT 9-03.12(1)A Class A.

E. GRAVEL BACKFILL FOR PIPE ZONE BEDDING. Per WSDOT 9-03.12(3).

PART 3 - EXECUTION

3.01 GENERAL

A. Weather Limitations. Construction shall progress only when weather conditions will not adversely affect the quality of the finished work. Soils that are not compactable due to saturation, shall be aerated or removed and replaced with a compactable material. Contractor shall bear all costs for rework caused by weather conditions.

B. Control of Water. The Contractor shall furnish, install and operate all necessary machinery and equipment necessary to keep excavations and earth embankments reasonably free from water during construction. Excavation shall be kept dry and water shall be disposed of so as not to cause injury to public, damages to adjacent property or to cause a nuisance or menace to the public. Water shall be removed to prevent softening of foundation bottoms, undercutting of foundations causing changes in soil conditions that will be detrimental to stability of subgrades and foundations. The Contractor shall establish and maintain positive drainage away from excavations via temporary drainage ditches and other diversions outside of excavation's limits to convey water from excavations to natural drainage courses. In addition, Contractor is to provide a dewatering plan with provisions to prevent contaminants (silt, construction debris, etc.) from entering local waterways. See TESC Plan on sheet C2.4. **It is expected that dewatering work will be needed during the 8' diameter wet well excavation work.**

C. Water for Compaction. Contractor shall provide all water as necessary to moisture-condition Structural Fill material to achieve required compaction densities.

D. Excavation for Structures.

1. Conform to elevations and dimensions shown with a tolerance of plus or minus 0.10 feet and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services and other construction.
2. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade prior to placement of concrete reinforcement. Trim bottoms to required lines and grade to provide solid base for structure.
3. Gravel Backfill for Foundations shall be placed under all concrete slabs, footings, and foundations to a minimum depth of six (6) inches, unless otherwise indicated, on exposed, undisturbed subgrade immediately upon completion of excavation.

E. Disposal of Excavated Materials. The Contractor is responsible for ultimate disposal of all excavated material and such disposal shall be incidental to other work. See grading and erosion control plans.

F. Over Excavation. Excavation of materials beyond the indicated subgrade elevations shall be backfilled with Structural Fill and compacted to provide a firm and stable base at the desired elevation. Work required to remedy over excavation not authorized by the Owner or the Engineer shall be at the Contractor's expense.

G. Stability of Excavations. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace, as required, to prevent cave-ins. Remove prior to backfilling unless otherwise specified.

H. Stockpile excavated materials classified as suitable material where directed, until required for fill. Place, grade, and shape stockpiles for proper drainage and erosion control as approved by the Owner.

I. The Contractor's bid price shall include all costs associated with providing materials and methods for the geogrid-reinforcement where specified.

3.02 SITE PREPARATION

A. Clear, strip, and grub surface and subsurface deleterious matter and all roots greater than 1/2-inch in diameter. Vegetation and trees shall be disposed of offsite at a dump site secured by the Contractor. Remove all topsoil within the limits of proposed improvements and structures. Topsoil may be stockpiled on site at the designated stockpile sites shown on the plans. When finished with stockpile areas, restore to final grade and restore ground surface per the plans and specifications.

B. Prior to placement of Structural Fill under buildings, structures, and roadways embankments, scarify, moisture-condition, and compact subgrade soils to at least 95% of the maximum dry density (MDD) based on ASTM D-1557 if not already at 95% of the MDD. Subgrade preparation per WSDOT Standard Specification section 2-06.

C. Benching subgrade. Slopes to be filled, which are 5:1 or steeper, shall be benched before receiving structural fill. Each bench shall be level in all horizontal directions and shall be at least 8 feet wide (perpendicular to slope contours).

3.03 STRUCTURAL FILL

A. Structural Fill shall be placed in lifts not exceeding 10-inches in loose thickness before compaction. Structural Fill shall be compacted to 95% maximum dry density (MDD) based on ASTM D-1557.

B. Where material must be moisture-conditioned before compaction, uniformly apply water to surface of subgrade or to layer of material, to prevent free water appearing on surface during or subsequent to compaction operations. Remove and replace, or scarify and air dry soil that is too wet to permit compaction to required density. Material that has been removed due to excessive moisture may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing or pulverizing until moisture content is reduced to satisfactory value.

C. Maintain Structural Fill areas as a continuous working surface throughout the project. Fill surfaces are to be graded smooth and sealed or covered as appropriate at the end of each work day to prevent unacceptable wetting. After periods of rain, remove any soft material prior to placement of additional fill.

F. Provide cut and fill slopes reasonably true to line and grade with a tolerance of plus or minus 3 inches.

3.04 BACKFILL OF STRUCTURES

A. Structure backfilling shall comply with the most recent version of WSDOT Standard Specifications, Section 2-09.3(1)E *Backfilling* and per the Plans.

3.05 GRADING

A. General. Uniformly grade areas within limits of project site including adjacent transition areas. Smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where finish elevations are shown or between points where finish elevations are shown or between such points and existing grades.

B. Drainage Ditches. Finish ditches to ensure proper flow and positive drainage. Conduct final rolling operations to produce a hard, uniform and smooth cross-section. Line swales and ditches with Quarry Spalls as shown on the plans or as otherwise shown o the plans.

3.06 DISPOSAL OF UNSUITABLE FILL MATERIAL

A. Excavated unsuitable material shall be disposed of off site.

B. All material which is hauled off of job site shall be documented with receipts, documenting weight (or volume agreed upon with Engineer for truck counts) and certification that it was transferred to a legal fill site. Receipts to be provided to Owner.

END OF SECTION

SECTION 02260 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF SECTION

A. This section includes all work related to providing temporary support and protection for excavations to safeguard public health, protect workers, protect existing improvements and insure the safe prosecution of the work. The Contractor may elect to employ any combination of shoring, tunneling, boring, sliding trench shield, or other means to complete the work.

B. The Contractor shall provide all equipment, material, labor and design services necessary to develop and maintain adequate excavation support and protection. The Contractor shall determine the need for and adequacy of excavation support and protection requirements.

C. The Contractor shall be solely responsible for any excavation support and protection or trench safety systems employed on the project. In no way shall the Owner assume any responsibility for the protection of life or property implied by the use of such systems.

1.02 RELATED SECTIONS:

A. Related work specified elsewhere:
   1. Section 02315 - Trench Excavation and Backfill

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 Subpart P - Excavations

1.04 LAWS AND REGULATIONS

A. The Contractor shall comply with and give notices required by all federal, state, and local laws, ordinances, rules, regulations and lawful orders of public authorities applicable to performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither the Owner nor Engineer or their staff will be responsible for monitoring Contractor’s compliance with Laws and Regulations.

B. All structure excavation, trenching, and shoring shall be performed in strict compliance with 29 CFR 1926 Subpart P - Excavations as well as all other applicable local, State, Contracting Agency, and Federal laws and regulations.”

C. The Contractor is to provide a stamped shoring plan prior to beginning excavation work in areas where required. OSHA standards are to be followed at all times, and minimizing risk is a priority.

1.05 MEASUREMENT AND PAYMENT

A. The costs for Excavation Support and Protection shall be included in the lump sum price for Trench Safety Systems. No extra payment will be made unless the quantity of trenching changes as direct result of a change in the scope of work by an approved change order.

PART 2 - PRODUCT

This Section Not Applicable.

PART 3 - EXECUTION

3.01 METHODS

A. The Contractor shall make the determination as to the most effective means for ensuring excavation support and protection. This may include, but is not limited to, the following:
   1. The Contractor may dig open pits or perform extra excavation (at no expense to the Owner) without shoring or cofferdams.
   2. Use of shoring or cofferdams if in compliance.
   3. Specific requirements related to working in trenches shall conform with WSDOT *Standard Specifications*

B. Any damage to existing or proposed improvements resulting from the Contractor's excavation support and protection system shall be repaired and included as a part of this pay item.

END OF SECTION

SECTION 02315 - TRENCH EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work within this section includes trenching, bedding, backfilling, compacting and disposal of excess materials as required for installation of all underground utilities, conduit and other miscellaneous structures.

B. The Contractor shall supply all material, equipment and labor necessary to complete the excavation and backfill operations necessary to install the underground utilities depicted on the plans.

1.02 RELATED SECTIONS

A. Related work specified elsewhere:
1. Section 02200 - Earthwork
2. Section 02260 - Excavation Support and Protection
3. Section 15100 - Piping

1.03 REFERENCE SPECIFICATIONS

A. The most recent version of the WSDOT *Standard Specifications*.

1.04 QUALITY ASSURANCE

A. The Contractor shall comply with the requirements of all applicable regulatory agencies having jurisdiction over this work including 29 CFR PART 1926 -- SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.

B. There shall be a minimum of one in place density measurement per every 100 LF of trench. The Engineer may increase or decrease the frequency if the properties of the soils being placed change or the equipment or procedures used by the Contractor for compacting the soil change. In place density shall be measured using ASTM D-1556 or ASTM D2922 and D3017 (nuclear density) test methods. The Owner will subcontract testing work through a certified testing lab, and Contractor is required to coordinate with testing lab as work progresses.

C. Material sample and proctor test results shall be provided in advance for any proposed fill material not certified to be compliant with WSDOT Standard Specs.

1.05 JOB CONDITIONS

A. The Contractor shall provide protection of existing utilities affected by the work and make every effort to minimize disruptions to all utility services.

B. If, during the course of construction, it is anticipated that excavation will interrupt traffic or parking areas for longer than 10 to 15 minutes the Contractor must provide advance notice to the Owner. For longer intervals or complete shut-downs, the Owner requires 48 hour advance notice. This advance notice allows time to provide Tribal Council notification, obtain approval and deliver community notices in advance of the route delays or re-routes. In the event of such road closures, the Contractor shall be solely responsible for all traffic control measures including but not limited to flagging, barricades and cones.

C. The Contractor shall provide a traffic control plan per WSDOT requirements. Traffic control plan to be submitted for review and acceptance prior to commencing work. See Section 01300 Submittals.

D. Trenches shall be closed or covered with steel plates at the end of each work day.

1.06 SUBMITTALS

A. The Contractor shall furnish the following submittals as part of completing the work associated with this section:
   1. Location of disposal sites for excess excavated material.
   2. Gradation test results for imported foundation, bedding and backfill material.
   3. Proctor tests for proposed imported materials which are not identified as approved for use by WSDOT.
   4. Geotextile fabrics cut sheets or WSDOT QPL.

PART 2 - PRODUCTS

2.01 FOUNDATION SUPPORT

A. Where the base of the trench or excavation lacks the stability to support the structure, unsuitable material shall be replaced with aggregate complying with the most recent version of the WSDOT Standard Specifications, Section 9-03.12(1) —*Gravel Backfill for Foundations, Class A.*

2.02 PIPE ZONE BEDDING

A. Pipe zone bedding material for all pipe shall comply with the most recent version of the WSDOT Standard Specifications, Section 9-03.12(3) — *Gravel Backfill for Pipe Zone Bedding*.

2.03 PIPE ZONE BACKFILL

A. Pipe zone backfill material for all pipe shall comply with the most recent version of the WSDOT Standard Specifications, Section 9-03.12(3) — *Gravel Backfill for Pipe Zone Bedding*, except where otherwise specified in the plans.

2.04 TRENCH BACKFILL

A. All on-site backfill for trenches outside of paved areas may be select (approved by the Inspector) native coarse sandy gravels free of debris, vegetation, trash, wood and rocks larger than 3-inches in the largest dimension.

B. All backfill for trenches within paved areas shall be $^{5}/_{8}$-inch minus crushed screenings or ½-inch minus crushed screenings per WSDOT Standard Specifications, Section 9-03.4.

2.05 STRUCTURE BACKFILL

A. All on-site backfill for structures outside of paved areas may be select (approved by the Inspector) native coarse sandy gravels free of debris, vegetation, trash, wood and rocks larger than 3-inches in the largest dimension.

B. All backfill for structures within paved areas shall be 5/8-inch minus crushed screenings or ½-inch minus crushed screenings per WSDOT Standard Specifications, Section 9-03.4.

PART 3 - EXECUTION

3.01 UTILITY LOCATION

A. The Contractor shall make every effort to identify the location of all existing underground utilities. The Pump Station No.4 Assessor Parcel Number (APN) is 3902280900670000 and Assessor Legal Description is LOT 4A&R LLAAS REC AF 2001200105. The Contractor shall provide 48-hours in advance of any excavation within road rights-of-way, the Contractor shall contact the appropriate utility locate service(s) as follows:
   - The utility locates for water, sewer, and "customer owned" utilities are to be performed by a private locate service (such as Applied Professional Services at 425-888-2590 or Central Locating Services at 425-489-4254).
   - The PSE electrical main lines, CNG gas lines, and Phone line utility locates are through Call Before You Dig at 1-800-424-5555.

3.02 TRENCH EXCAVATION

A. Trench excavation shall conform with the most recent version of the WSDOT Standard Specifications. Special attention shall be paid to the requirements for trench safety noting that all work shall be performed in strict compliance with 29 CFR 1926.

B. The Contractor shall be solely responsible for any shoring, cofferdams or trench safety systems employed on the project. In no way shall the Owner or Engineer assume any responsibility for trench safety or the protection of life or property implied by the use of trench safety systems.

C. The width of excavation for utility trenches shall be in accordance with WSDOT Standard Specification. No additional payment will be made for extra excavation required due to poor soil conditions.

D. See Section 02200 Earthwork for excess material disposal requirements.

E. The Contractor shall provide and operate all material, equipment and labor necessary to keep excavations and earth embankments free from water during construction. Dewatering shall prevent weakening foundations, undercutting trench walls, or otherwise affecting the stability of sub-grades and foundations. The Contractor shall establish and maintain positive drainage away from excavations to prevent surface water from entering excavations. Water shall be disposed of in a manner which prevents injury to public or damage to property.

F. The Contractor shall backfill or otherwise cover all trenches at the end of each working day to protect public safety. The length of open trench excavation in advance of pipe laying operations shall not exceed 200 feet unless approved by the Owner. In no case shall the length of an open trench or size of an excavation exceed the Contractor's ability to safeguard the public welfare.

3.03 BEDDING

A. Pipe bedding and pipe zone backfill installation shall comply with the WSDOT Standard Specifications, Section 7-08 — *General Pipe Installation Requirements* and per the Plans.

B. Pipe bedding and pipe zone backfill shall be compacted to 90% of the maximum dry density described in ASTM D1557. Pipe bedding and pipe zone backfill shall be compacted in 6-inch maximum lifts.

3.04 BACKFILL

A. Trench and structure backfilling shall comply with the most recent version of WSDOT Standard Specifications, Section 7-08 — *General Pipe Installation Requirements* and per the Plans.

B. Structure backfilling shall comply with the most recent version of WSDOT Standard Specifications, Section 2-09.3(1)E *Backfilling* and per the Plans.

C. In areas beneath driveways, sidewalks, or within 5-feet of the roadway template (including shoulder or structures), backfill shall be compacted to 95% of the maximum dry density described in ASTM D1557. Backfill within the roadway template shall be compacted in 6-inch maximum lifts.

D. In landscaped or native areas outside roadway templates and not beneath pavement, gravel paving, drives or sidewalks, backfill shall be compacted to 85% of the maximum density described above.

E. Construction shall progress only when weather conditions will not adversely affect the quality of the finished work. At the same time, the Contractor must be prepared to take such measures as are necessary to complete the construction within the specified contract period. Where soils cannot be compacted due to moisture content, material shall be aerated or removed and replaced with a suitable granular backfill material. Contractor shall bear all costs for necessary extra measures and/or rework if excavated material is made unsuitable by adverse weather conditions and not protected by contractor in accordance with WSDOT Standard Specifications covering contractor requirements for protection of excavated materials.

3.05 UNSUITABLE TRENCH OVEREXCAVATION

A. In the event that during trenching unsuitable material is encountered at the trench bottom, the Owner shall be notified of such areas prior to placing pipe. The specific areas of unsuitable material shall be addressed as described herein. Work under this item shall be allowed ONLY upon written authorization of the Owner.

B. Unsuitable material shall be overexcavated 18-inches below the trench neat line and filled with crushed surfacing conforming to WSDOT 9-03.9(3) and compacted to 95 percent of maximum dry density described in ASTM D1557. Fill up to the trench neat line to allow room for the bedding material.

END OF SECTION

SECTION 02370 - EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work in this section consists of temporary measures for the prevention of accelerated soil erosion and sedimentation of streams or other bodies of water.

- The erosion and sediment control measures shown in the plans and specifications are the minimum requirements for the anticipated site conditions. The Contractor shall maintain and upgrade these measures as necessary to prevent sediment-laden water or turbid water from either flowing off the site, or into new/existing storm drainage facilities such as catch basins, culverts, or storm sewers. In addition, the Contractor shall note all BMPs or Erosion/Sediment control measures implemented on the TESC Plan Sheets in red, for the life of the Contract. Updated plan sheets will be available for review at all times at the project site.

- Implementation of the TESC Plan shall include, but is not limited to, installing, maintaining, inspecting and repairing all temporary erosion and sediment control and spill control Best Management Practices (BMPs) included in the plans and as defined in the current edition of the Washington State Department of Ecology Stormwater Management Manual for Western Washington and as defined by the EPA. All BMPs shall be inspected, maintained, and repaired by the Contractor as needed to assure continued performance of their intended function. All on-site erosion and sediment control measures shall be inspected at least once every seven days and within 24 hours after any storm event of greater than 0.5 inches within a 24-hour period. Damaged or inadequate erosion control measures shall be corrected within 24 hours of the inspection. The Contractor shall ensure that erosion and sediment control measures are in place and functional at the end of each work day.

- If erosion and sediment control measures are observed to be not functional, the Owner/Engineer will notify the Contractor of the deficiency. The Contractor shall have four hours to correct the deficiency if it is raining and runoff is present. Otherwise, the Contractor shall have eight hours or until the end of the day to correct the deficiency. The rigorous enforcement of erosion and sediment control measures is necessary to prevent turbid runoff from the project site.

- The Contractor shall respond immediately to any urgent request by any governmental agency. If there is no response within two (2) hours, the Owner may elect to either take action themselves or hire another Contractor to perform needed repairs/installations. All costs incurred to accomplish this,

including labor, overhead, materials, management, etc., will be deducted from the next pay request.

- ***Permanent Stabilization***
  Existing vegetation shall be preserved where possible within the project limits. The primary objectives shall be the prompt restoration and reseeding of disturbed areas, and to provide immediate slope stability and erosion control. The latter may be accomplished using a combination of hand seeding and mulching. All temporary erosion and sedimentation control BMPs shall be removed within 30 days after final site stabilization or after the facilities are no longer needed.

1.02 RELATED SECTIONS

A. Related work specified elsewhere:
1. Section 02200 - Earthwork
2. Section 02260 - Excavation Support and Protection
3. Section 02315 - Trench Excavation and Backfill

1.03 SUBMITTALS

A. The Contractor shall submit product specifications and installation recommendations for all materials to be provided under this section.

PART 2 - PRODUCTS

2.01 Any product, that is required for adequate erosion control, including, but not limited to: construction access ramps, check dams, silt fence, hydroseeding, plastic ground cover, jute matting, etc. Products shall be in accordance with the Standard Specifications Section 9-14.

A. Temporary Silt Fence
1. Temporary silt fence shall meet the requirements of Standard Specifications Section 9-33.2.

B. Stabilized Construction Entrance
2. Quarry spalls for stabilized construction entrances shall meet the requirements of Standard Specifications Section 9-13.6.
3. Geotextile shall meet the requirements of Standard Specifications Section 9-33.3 in the Special Provisions.
4. CPE pipe shall meet the requirements of Standard Specifications Section 9-05.19.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall carry out the provisions of the TESC Plan.

3.02 PLANNING OF CONSTRUCTION

A. Plan and coordinate the construction to reduce sediment pollution. Minimize the area of disturbance. Keep the area of clearing and grubbing to the minimum necessary to facilitate construction.

3.03 MAINTENANCE

A. Maintain the erosion control measures and facilities in proper condition so that they will individually and collectively perform the functions for which they were designed and per the TESC Plan. In order to insure the effectiveness and proper maintenance of the measures and facilities, the Contractor and Owner shall make periodic inspections at sufficiently frequent intervals to detect any impairment of the structural stability, adequate capacity, or other requisites of the herein approved measures and facilities which might impair their effectiveness. The Contractor shall take immediate steps to correct any such impairment found to exist at no additional cost to the Owner.

B. Inspection, or lack thereof, shall not relieve the contractor of the responsibility of maintaining erosion control at all times. The contractor should, therefore, check all erosion control periodically on their own to ensure adequacy.

3.03 PUMP WATER

A. Practice sound pump water management to reduce sediment production. Discharge pump water onto stabilized surfaces and allow to soak into vegetated ground and filter through existing vegetation. Provide BMPs, as needed, to remove all sediment from pumped groundwater which may flow off-site. Repair discharge areas, upon completion of construction, to pre-existing conditions or better.

3.04 STABILIZATION

A. Stabilize all slopes, channels, ditches or any disturbed area as soon as possible after the final grade or final earthmoving has been completed. Upon completion of the project, stabilize all areas which were disturbed by the project to prevent accelerated erosion. Maintain any erosion and sedimentation control facility

required or necessary to protect areas from erosion during the stabilization period, regardless of the length of time required - even if it extends beyond the date of substantial completion.

3.05 EARTHWORK

A. Control excavation for site work operations. Stockpile the material removed from the excavation in areas where a minimum of sediment will be generated and where other damage will not result from the piled earth. Stockpile topsoil separately and redistribute uniformly after grading.

B. Protect all stockpiled soil materials from erosion through the use of plastic sheeting or similar temporary measures.

END OF SECTION

SECTION 02830 – FENCES AND GATES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work consists of furnishing all labor, materials, and incidentals necessary to erect all 6-foot high galvanized chain-link fence and gates with 3 strand barbed wire on top (7-foot total height) at the location shown on the drawings. Barbed wire is to be aligned in vertical position on gates and aligned in an outward angled position on rest of fencing. Construction is to provide a rigid, taut fence closely conforming to the surface of the ground. It is noted that **bottom rails** are to be included for preventing access under fence fabric.

B. Work included

1. Fabric, line posts, end, corner and pull posts, gate posts, gate frames, top rails, bottom rails, and post braces and accessories.

1.02 RELATED SECTIONS

A. Section 05500 - Metal Fabrications

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. A 53 Standard Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.

2. A 153 Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

3. A 392 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.

1.04 SUBMITTALS

A. Three samples, approximately 6 inches long, or 6 inches square, of fabric material (standard galvanized), post section and typical accessories.

B. Submit shop drawings showing fence height, type of fabric, and location and size of posts and gates, including details of post tops, rails, braces, foundations, footings, gate posts, hinges, frames, latches, ties and other accessories.

SECTION 02830 – FENCES AND GATES

1.05 QUALIFICATION OF INSTALLER

A Installer must be experienced in fence installations and must examine conditions under which fence and gates are to be installed. The Contractor shall notify the Engineer in writing of improper conditions of work, and shall not proceed with work until unsatisfactory conditions have been corrected.

1.06 QUALITY ASSURANCE

A Certifications

PART 2 - PRODUCTS

2.01 FENCES, POSTS, RAILS AND BRACES

A. All steel tubular members shall comply with provisions of ASTM A 53, Schedule 40, for weight and coating.

2.02 FABRIC

A. Chain link fabric to conform to ASTM A 392, No. 9 gage wire, 2-inch mesh, Class II galvanizing.

B. Fabric galvanized after weaving.

C. Fabric knuckled at bottom selvage and twisted and barbed at top.

2.03 LINE POSTS

A. Posts of galvanized steel.

B. Posts round in section, with 2.375-inch outside diameter and weighing 3.65 lb/ft.

2.04 END, CORNER PULL POSTS

A. Posts of galvanized steel.

B. Posts round in section, with 2.875-inch outside diameter and weighing 5.79 lb/ft.

2.05 GATE POSTS

A. Posts of galvanized steel.

B. Gate leaves over 6 feet - 0 inch and up to and including 13 feet - 0 inch wide: 4 inches O.D. Schedule 40 pipe and weighing 9.1 lb/ft.

C. Gate leaves over 13 feet 0 inch and up to and including 18 feet 0 inch: 6-5/8 inch O.D. Schedule 40 pipe and weighing 18.97 lb/ft.

2.06 GATE FRAMES FOR CHAIN LINK FENCING

A. Frames of galvanized steel.

B. Frames round in section, with 1.9-inch outside diameter, and weighing 2.72 lb/ft.

C. Frames shall have intermediate members and/or diagonal truss rods for gate leaves more than 8 feet wide.

D. Gate frame joints shall be made by welding or by means of heavy fittings making rigid and watertight connections.

2.07 TOP RAILS, BOTTOM RAILS, AND POST BRACES

A. Top rails, bottom rails, and post braces of galvanized steel.

B. Top rails, bottom rails, and post braces round in section, with 1.66-inch outside diameter, and weighing 2.27 -lb/ft.

2.08 BARBED WIRE

A. Barbed wire shall be double strand twisted 12-1/2 gauge galvanized with 14 gauge, 4 point barbs spaced on approximately 5-inch centers. Extension arms to accommodate barbed wire shall withstand a 250-pound pulldown load from end of arm.

2.09 ACCESSORIES AND ATTACHMENTS

A. Stretcher bars: Galvanized steel 3/16 by 3/4-inch in cross section, or equivalent cross section with length equal to full height of fabric.

B. Truss rods: Galvanized steel, 3/8-inch-diameter, or equivalent cross section, and shall have suitable adjustment.

C. Post tops: Caps of pressed galvanized steel. Provide with a hole suitable for through-passage of the top rail. Fit snugly to the post, have means for attaching securely to the post and exclude moisture from tabular posts.

D. Gates swing: Swing type, complete with latches, stops, keepers, hinges, locks and fabric. Fabric to match fence. Hinges of adequate strength to support gate and not twist or turn under action of gate. Latches of plunger bar type and full gate height located in a manner that will engage the gate stop. Forked latches used for single gates less than 10 feet wide. Latches shall provide for locking. Stops shall consist of a flush plate with anchor placed in concrete to engage the plunger bar of the latch. Other approved types of stops may be used for single gates less than 10 feet wide. Keepers shall be substantial devices for securing and supporting the free end of the gate in open position.

E. Top rail and bottom rail couplings: Outside sleeve type at least 6 inches long. At least 20% of the couplings shall have an internal heavy spring to take up expansion and contraction.

F. Brace wire, tie wire, and tension wire:

1. Galvanized wire meeting requirements of ASTM A 12 1, Class 3 coating.
2. Unless otherwise designated, size of wire shall not be smaller than the following:

Tension wire	No. 7
Brace wire	No. 9
Tie wires or clips for fastening field fence to steel posts	No. 12

3. Tie wires for chain-link fence of size and type recommended by manufacturer, but not smaller than No. 9 for post ties or No. 12 for rail and brace ties. Equivalent galvanized steel clips or aluminum wire or clips may be used as accepted by the Engineer.

G. Galvanizing: All pipe sections galvanized after fabrication shall be in accordance with ASTM A 53. All other items incidental to erection of fence except fabric and wire fabric ties galvanized after fabrication in accordance with ASTM A 153. Wire fabric ties will have not less than 0.8 ounce of zinc per square foot.

2.10 CONCRETE FOOTINGS

A. Concrete shall be mixed and placed in strict accord with Section 03300.

PART 3 - EXECUTION

3.01 CLEARING AND GRADING

A. Contractor shall perform such clearing and grading as necessary to construct fence to required alignment and provide a reasonably smooth ground profile at the fence line.

3.02 POST ASSEMBLIES

A. End, corner, gate, and pull or intermediate anchor posts placed at designated locations.

B. Posts securely braced and holes filled with concrete. Form not required for post encasement

3.03 HORIZONTAL DEFLECTION

A. At points of deflection where fence changes alignment by more than 5 degrees provide a post brace and truss rod in each fence panel to the post located at the angle point.

B. Footings for all posts located at points where the change in alignment exceeds 5 degrees shall be constructed as specified for end posts.

3.04 LINE POSTS

A. Line posts spaced at not more than 10-foot centers.

3.05 POST BRACES

A. A brace and truss assembly shall support each gate, comer, pull, or end post for chain link fencing. Brace shall extend to each adjacent line post at mid-height of fabric. Truss shall extend from line post back to gate, corner, pull, or end post.

3.06 FABRIC

A. Fabric shall not be erected until 5 days after the time of setting the posts in concrete. Fabric shall be fastened to line posts with clips or bands spaced approximately 12 inches apart and to top rail with bands or tie wires at approximately 24-inch intervals. Pull fabric taut and tie to posts, rails and tension wires. Install fabric on security side of fence and anchor to framework so that fabric remains in tension after pulling force is released.

3.07 TENSION WIRES

A. Tension wires installed at bottom of fabric before stretching fabric and tied to each post with wire ties or clips.

3.08 ELECTRICAL GROUNDS

A. Chain-link fence which crosses beneath any primary electrical power transmission line, other than a secondary feeder line for individual customer service, shall be properly grounded. Grounding shall consist of placing one ground rod at point of crossing and one 25 to 50 feet in each direction from the crossing.

1. Chain-link fence erected adjacent to and within 50 feet of a primary power line shall be grounded by placing ground rods at not more than 500-foot intervals.

2. Each applicable straight section of fence shall have at least one ground. Engineer may require installation of an additional ground at terminus of a section of fence or at other locations near areas of pedestrian traffic.

3. Ground rod shall be connected to fence.

END OF SECTION

SECTION 02920 - LANDSCAPING

PART 1 - GENERAL

1. 1 DESCRIPTION OF WORK

A. Work in this section shall include all labor, equipment and materials necessary for re-establishing grass vegetation in areas disturbed during construction. Work shall include stripping, excavation, hauling, stockpiling, placing topsoil, placing compost, and hydro-seeding.

1.2 RELATED SPECIFICATIONS

A. Section 02200 – *Earthwork*

B. Section 02370 - *Erosion and Sedimentation Control*

1.3 SEEDING GUARANTEE

A. During the one (1) year guarantee period should any seeded area show signs of failure such as dead or dying areas of grass, bare spots, dead or dying plants, etc., the Contractor shall repair or replace all deficient items to the satisfaction of the Engineer.

B. All graded areas not seeded or paved by October 15 shall be covered with two (2) inch depth straw to prevent erosion. Straw to be provided and installed by the Contractor. Do not perform planting or seeding when ground is frozen, snow covered, muddy or in an otherwise unsatisfactory condition. When unforeseen conditions detrimental to plant growth are encountered, such as adverse drainage conditions, obstructions, compaction, or toxified soils, notify the Engineer before proceeding.

1.03 SUBMITTALS

A. The Contractor shall submit product specifications and installation recommendations for all materials to be provided under this section.

B. Submit seed vendor’s blue tag certification for required grass seed mixture, indicating percentage by weight, and percentages of purity, germination, and weed seed for each grass species.

C. Upon seeded areas acceptance, submit written maintenance instructions recommending procedures for maintenance of seeded areas.

PART 2 - PRODUCTS

2.1 TOPSOIL MATERIAL

A. Topsoil shall conform to Section 9.14.1(2) of the Standard Specifications.

2.2 GRASS SEED

A. Seed shall conform to Table 1 below. Seed of the following composition, proportion, and quality shall be applied at a rate of 8 pounds per 1000 square feet:

Table 1

Common Name	% by Weight
Nobility Perennial Ryegrass	30
Amazing GS Perennial Ryegrass	30
Longfellow II Chewings Fescue	20
Gibilbralter Creeping Red Fescue	20

This mixture is provided by Sunmark Seeds under the name DOT Multipurpose Mixture. Seeds shall be certified “Weed Free” indicating there are no noxious or nuisance weeds in the seed.

2.3 FERTILIZER

A. Fertilizer shall be a granular, non-burning product composed of not less than 50% organic, slow acting, guaranteed analysis professional fertilizer. Seeded area starter fertilizer containing 20% nitrogen, 26% phosphoric acid, and 6% potash by weight, or similar approved composition applied at a rate of 6.5 lbs/1000 SF.

2.4 WOOD FIBER MULCH FOR HYDRO-SEEDING

A. Hydro-seeding to be applied to all areas disturbed and/or regraded (which will not be protected with quarry spalls, gravel, and/or pavement) during construction. Commercially prepared wood fiber mulch specifically manufactured for hydro-seeding application shall be used.

B. Dispersing agents may be added at Contractor's option provided that the additive is not harmful to the mixture.

2.5 WATER

A. The Contractor shall furnish water as required for planting and establishing vegetation in seeded areas. Provide all necessary hoses, equipment, attachments, and accessories for adequate watering of seeded areas.

PART 3 - EXECUTION

3.1 SEEDING

A. Inspect all subgrades for debris and adverse drainage conditions. Remove all debris including rocks 1-inch in diameter and larger, sticks, roots, sod and other deleterious material. Notify the Owner of any grades or conditions which might create adverse or undesirable drainage patterns.

B. Smoothly blend and feather topsoil into existing surrounding grades. Rake or lightly harrow topsoil until the soil is friable and of uniform texture and satisfactory for seed placement.

C. After seeding, topsoil shall be rolled for compaction and shall be minus ½-inch below all adjacent paved or graveled surfaces. Irrigate immediately until soil is damp to about 6".

D. The hydro-seeding operation shall include the installation of seed, fertilizer, mulch, and tackifier with a tracer to verify uniform application.

E. Hydro-seeding shall be done in accordance with WSDOT Spec. 8-01.3(2)B.

F. Seed immediately after preparation of seed bed. Seeding may occur August 15 to October 15.

G. Seed shall be applied at a rate listed above.

H. Mulch shall be applied at a rate of 2,000 pounds per acre.

3.2 MAINTENANCE AND WATERING

A. Patch, repair and re-seed any and all damaged or barren areas observed prior to final project acceptance at no additional cost to the Owner.

B. The Contractor shall protect and care for all seeded areas until fully established and hearty. Care shall include equipment and labor necessary to provide sufficient and continuous watering of all seeded areas until final acceptance.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Products installed but not furnished under this Section:
   1. Embedded anchors, embedment angles for inserts, hangers, bolts, and structural steel shapes shown and specified.

1.2 REFERENCES

A. Drawing Structural Notes, which provide additional structural specifications. The Drawing Structural Notes control in the event of conflict with these specifications.

B. International Code Council. 2009 IBC - “International Building Code”

C. American Concrete Institute (ACI).
   1. ACI 318 - "Building Code Requirements for Reinforced Concrete."
   2. ACI 347 - "Recommended Practice for Concrete Formwork."
   3. ACI 350/350R-01 – “Code Requirements for Environmental Engineering Concrete Structures and Commentary”
   4. ACI 117 - "Specification for Tolerances of Concrete Construction”

D. American Society for Testing and Materials (ASTM).
   1. D 1751 - "Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)."

E. Western Wood Products Association (WWPA). "Grading Rules for Lumber, latest edition.”

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Conform with applicable requirements of the 1997 UBC, Chapter 19 - Concrete. Contractor solely responsible for all costs associated with concrete testing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Formwork:
   1. Lumber: Stress grade marked Douglas Fir-Larch. Graded in accordance with WWPA. Plywood CD-X except vaults use MDO-faced.
   2. Form Coatings: Non-staining, shall not cause dusting or softening of concrete surface. They shall produce a smooth, hard, non-oily concrete surface which will bond with concrete paints and cement coatings.

3. Form ties and spreaders: Metal cone nut type or as necessary to meet requirements for form design specified.
4. Rough hardware: Nails, bolts, screws, anchors, and similar items as required.

B. Concrete reinforcement:
1. Reinforcing bars: In accordance with requirements of Structural Notes.
2. Welded wire fabric: ASTM A 185, 6 x 6 W5.5 x W5.5, lap 12 inches at splices. Furnish in sheets, not rolls. Provide and install welded wire fabric in misc. concrete structures where reinforcing is not specified (excluding exterior sidewalks).
3. Tie wire: American wire 16-gage or heavier black annealed wire.
4. Supports for Reinforcement:
   a. Bolsters chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place:
   b. Use wire bar type supports complying with CRSI recommendations, unless otherwise shown or specified. Do not use wood, brick or other similar materials.
   c. For slabs on grade, use concrete blocks or supports with sand plates or horizontal runners where base material will not support chair legs.
5. All exterior sidewalks shall be constructed with integral fiber reinforcing per ASTM C1116-89. Integral fiber reinforcing shall consist of 100% virgin polypropylene or polyester (P.E.T.) monofilament with a specific gravity of 1.34, fiber length of 1.5 inches and thoroughly mixed in the concrete at a rate of 1.5 pounds per cubic yard. All sidewalks shall be 4" or 6" thick (as shown on plans), and supported by a four-inch subgrade of top course per WSDOT 9-03.9(3).

C. Cast-in-place concrete:
1. Portland Cement: Per Structural Notes.
2. Standard Weight Aggregates: ASTM C 33 from acceptable pits. Maximum size used in a particular location shall be consistent with the form and dimensions of section being placed, with the location and spacing of reinforcing steel and with the method of vibration. See structural notes.
3. Water: clean, potable, and free of deleterious materials.
4. Admixtures per Structural Notes.
5. Curing Materials:
   Fiber reinforced asphaltic vapor barrier Kraft paper. Damp cure only.
   Polyethylene sheet, 4-mil thickness.
6. Premolded Expansion Joint Filler: ASTM D 1751.

D. Control Density Fill:
1. Per WSDOT 6-02.3(2)D – Lean Concrete.

E. Cement Grouts:
1. Anchor Bolt and Plate Grout for Non-Mechanical Equipment:

Cement grout to fill anchor bolt pockets, handrail pockets, and under non-mechanical equipment base plates shall be Master Builders Embeco 636 grout or equal having non-shrink capabilities and 5,000 psi compressive strength in seven days.

2. Portland Cement Grout:
   Portland Cement Grout shall be used to provide slopes between wall and slabs shall be 1 part Portland Cement to 2 ½ parts sand with an expansive agent to limit shrinkage. Sufficient water shall be added for placement while maintaining a minimum 4,000 psi 28 day compressive strength and water to cementatious materials ratio not exceeding 0.40. Specification for grout sand shall be as follows:
   a. Sand shall be clean, natural and consisting of hard, dense, strong particles. It shall be free from injurious amounts of dust, lumps, soft or flaky materials, shale, mica, loam, organic material, and other deletorious substances.
   b. Sand shall have a specific gravity not less then 2.6.
   c. The washed sand shall be graded from coarse to fine and, except as provided below, shall conform to the following requirements:

Sieve Size	Percent Passing
#8 Sieve	95-100
#16 Sieve	65-90
#50 Sieve	10-30
#100 Sieve	3-10

   d. The individual size fraction shall not exceed 35%. The fineness modulus shall not be less than 2.5 nor more than 3:1.

F. Epoxy Grout:
Epoxy grout to be used for mechanical equipment base pads. Epoxy shall be a moisture-tolerant three-component mix: two-part epoxy resin and aggregate. Epoxy grout shall be specifically labeled for long-term support and precision alignment of machinery and conform to ASTM C 881, TYPE IV, Grade 1, such as Master Builders Technologies MASTERFLOW 648 CP PLUS or Sika Corporation SIKADUR 42 GROUT PAK.

G. Waterstops:
Waterstops shall be formed of a waterproofing grout and cementatious treatment system, per Kryton/Krystol or approved equal. Remove all dirt, coatings, and debris from concrete surface. Install waterstop per manufacturer's instructions.

H. Embedment Angles for Grating:
Embedment angles shall be as specified in Section 05400 – Grating.

2.2 MIXES

A. The various concrete mixes to be used are as follows:
   1. Provide air entrainment per Structural Notes in all concrete subject to freezing after curing.
   2. Classes of concrete are per the Structural Notes.
   3. Concrete mixes shall comply with ASTM C 94. Proportioning shall comply with Alternative 3; mixing and transporting shall comply with requirements for Truck-Mixed Concrete.

2.3 FABRICATION

A. Concrete reinforcement: fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI. Provide elbow or hairpin bars to lap horizontal bars at all corners and intersections. All hooks shall be "Standard" in accordance with ACI 318. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken material.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove foreign matter accumulated in forms. Wet wood forms sufficiently to tighten up cracks. Wet other materials sufficiently to reduce suction and maintain workability of concrete mix. Wet subgrade surfaces immediately prior to placing slabs on grade.

B. Dewater excavations prior to pouring concrete.

3.2 INSTALLATION

A. Concrete Formwork:
   1. Construct forms mortar tight, true to required lines, grades, and surfaces to obtain smooth, uniform concrete surfaces.
   2. Set construction joints and embedded items prior to concrete placement. Verify locations and types, and incorporate embedded anchors, inserts, hangers, bolts, and structural steel shapes for equipment and similar items shown on architectural, civil, electrical, and piping Drawings and as specified. Use setting drawings, diagrams, instructions, and directions provided by suppliers of the items to be attached thereto.
   3. Shores and Braces: Install as necessary to support construction loadings and as required to maintain required tolerances. Comply with ACI 347.
   4. Leave forms in place a minimum of 3 days before removal, longer if required (see Structural Notes).

5. Remove forms carefully to avoid damaging corners and edges of exposed concrete. Upon removal of forms cut off bolts, wires and other projections of formwork anchorage.

B. Concrete reinforcement:
   1. Place reinforcing steel in accordance with Drawings, and applicable requirements of codes and standards. Install reinforcement accurately and securely against movement, particularly under the weight of workers and the placement of concrete.
   2. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which might reduce or destroy bond with concrete.
   3. Position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as required.
   4. Splices: provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tieing. Splice lengths shall be per drawings and structural notes. Avoid splices of tensile reinforcement at or near points of maximum stress. Splice locations not shown shall be reviewed and accepted before fabrication.

C. Cast-in-place concrete:
   1. Transport concrete from batch plant to place of final deposit as rapidly as practicable. Place concrete before initial set has occurred and in no event after it has contained water for more than 45 minutes.
   2. Place all concrete monolithically unless shown otherwise or approved prior to placement.
   3. Convey concrete from mixer to forms as rapidly as possible and deposit as nearly as practicable in its final position by methods which will prevent segregation or loss of ingredients.
   4. Thoroughly vibrate and tamp concrete so that all parts of forms are filled and so that no voids remain in mass or on surface. Take special care to work concrete through and around reinforcing steel. Provide 3” concrete cover on reinforcing steel unless noted.

D. Finishing concrete:
   1. General: Vibrate to compact, screed, level, and tamp with a grid tamper to raise a thin mortar bed to the surface. Trowel after concrete has hardened sufficiently to prevent drawing moisture to the surface. Do not dust with dry materials.
   2. Interior floor slabs: steel trowel and install joints straight and true. Do not apply curing compounds. Damp cure only. Slope concrete slabs 1/8” per foot to drains or as indicated on plans.
   2. Exterior sidewalks, steps, curbs, generator pads, and slabs on grade: steel trowel and medium broom finish.
   3. Exterior and Interior Exposed walls which include all walls above the proposed water surface shall have the following finish.

Defective work repaired, fins removed, and all offsets and projection ground smooth, and shall have all depressions 1/16-inch or larger in depth or width filled with mortar, and tie holes filled. The mortar shall consist of 1 part cement and 1-1/2 parts fine (passing No. 100 screen) mixed with enough water and an emulsified bonding agent to have the consistency of a thick cream. The surfaces shall be brush sandblasted prior to filling holes to expose all holes near the surface. Thoroughly wet surfaces and rub mortar on with burlap, sponge rubber floats, or trowels while surface is damp. Wipe surface clean and moist cure.

E. Curing concrete:

1. Interior slabs: damp cure only. Cover and maintain free moisture for 7 days.
2. Exterior flatwork: damp cure only, unless noted otherwise on drawings and structural notes. Cover and maintain free moisture for 7 days
3. Walls and slabs: Use two coats of NSF approved curing compound.

All water used for concrete mixing & curing to be from a potable water source.

F. Flatness Tolerances: interior and exterior slabs, 1/4 inch in 10 feet.

END OF SECTION

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of System: The work covered by this section consists of furnishing all labor, equipment and materials necessary for the preparation and application of the paint coatings as specified herein.

1.02 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Comply with the requirements of agencies having jurisdiction over this section of work, including, but not limited to:
   1. WISHA, Washington Industrial Safety and Health Act.

B. Reference Standards: All surface preparation, coating and painting shall conform to the applicable requirements of the:
   1. National Association of Corrosion Engineers
   2. Steel and Structures Painting Manual, Volume 2, Systems and Specifications (latest revision) published by the Steel Structures Painting Council (SSPC).
   3. American Water Works Association (AWWA) Standard D102 "Painting Steel Water Storage Tanks."

C. Manufacturer: Manufacturer shall be of established good reputation and shall have regularly engaged in the manufacture of such coatings for a minimum of 5 years. This experience shall include a minimum of 20 similar applications in which such coatings have proven satisfactory service for a minimum of 3 years.

D. Contractor: Contractor shall have 5 years of practical experience and successful history in the application of paint coatings to surfaces of municipal or industrial type equipment.

E. Paint Film Thickness: All painted surfaces will be inspected by the Contractor with approved wet-film thickness gages. Inspection will include the thickness measurement of each prime and finish coat.

F. Manufacturer's Representative: The manufacturer shall provide a qualified representative to visit the site from time to time during the paint operations as requested by the Engineer. The manufacturer's representative shall assist the Engineer in monitoring surface preparation and paint application.

1.03 SUBMITTALS

A. Submittals detailing product data and application procedures shall be submitted in accordance with Section 01300 for each paint service condition.

B. Color charts for each of the finish coats listed in Part II of this section shall be submitted at least thirty (30) days prior to the starting of painting.

C. A Schedule of the Painting Work shall be submitted to the Engineer at least fourteen (14) days prior to commencing of any work under this section. A revised schedule shall be submitted as requested by the Engineer to reflect changes or delays in the work.

1.04 JOB CONDITIONS

A. Environmental:
   1. Protective coatings shall not be applied in areas where dust is being generated or in any other areas where disturbances will affect the quality of the work.
   2. The Contractor shall comply with the manufacturer's recommendations as to environmental conditions (i.e. temperature, moisture, exposure to sunlight etc.) under which coatings and coating systems must be applied and cured.

B. Protection: The Contractor shall be responsible for protecting coatings or coating systems from any disturbances during or after application which will affect the quality of the work.

1.05 DELIVERY AND STORAGE

A. Delivery: All products shall be delivered in sealed containers with labels legible and intact. Labels shall include the following information: Manufacturer's name and stock number, type of paint or protective coating, color, instructions for reducing, label analysis, and federal specification number.

B. Storage: Products shall be stored in a single location and in a manner complying with all applicable safety, health and fire regulations.

PART 2 - PRODUCTS

2.01 GENERAL

A. Surfaces to receive insulation or other protective materials shall be coated or painted in conformance with the applicable Service Conditions as specified herein.
The intent has not been to identify each and every item to be coated, but only to list the major items. In no case shall any wood, ferrous metal or other surface, requiring protection, be left uncoated or unpainted.

B. The products specified are those which have been evaluated for the specific service and are given to establish a quality standard for that service. Products of other manufacturers comparable in quality and type to those specified will be acceptable if said paints are offered by the Contractor with satisfactory data on past performance in similar applications. Requests for substitutions shall be in accordance with Section 01600.

C. The Contractor shall use products of the same manufacturer for all prime and finish coats listed in each separate Service Condition.

D. Colors to be used shall be as designated by the Owner based upon the color charts provided by the Contractor.

E. For the paint thickness listed under each Service Condition:
   1. WT = wet-film thickness in mils
   2. DF = dry-film thickness in mils
   3. The number following equals the minimum film thickness required, per coat.
   4. Putty: Conform to FS TT-P-791A(3), colored to match paint and stain finishes, as applicable.

G. Cementitious Filler: Nonshrink formulation, white Portland cement with fine silicate aggregate, zinc-oxide pigment, and reinforcing chemical binder as approved.

H. Spackling Compound: Standard gypsum board compound.

I. Unspecified materials such as turpentine, linseed oil, or mineral spirits shall be products of reputable manufacturers and as recommended by paint manufacturers.

J. Materials for Undercoats and Finish Coats: Ready mixed, and shall not be changed, except thinning of undercoats (when required), reinforcing, or coloring, all of which shall be performed in accordance with manufacturers' recommendations.

SERVICE CONDITION A

A. Generic Type: Epoxy
B. Applications:
   1. All exposed metal piping (including exposed ductile iron piping), joints, fittings, valves, supports, fasteners, and misc. ferrous metal items for this project shall be painted. Copper, galvanized, aluminum, and stainless steel metal surfaces shall not be painted unless specifically specified. Exposed piping shall be defined as all piping that is not backfilled, permanently or intermittently submerged. Exposed piping in vaults is considered to be exposed and shall be painted.
C. Primer:
   1. One coat Tnemec Series 161- "High Solids Epoxy".
      DF = 4.0 to 6.0
D. Finish:
   1. One coat Tnemec Series 161- "High Solids Epoxy".
      DF = 4.0 to 6.0

SERVICE CONDITION B

A. Generic Type: PVC, Vinyl Copolymer
B. Application: PVC piping exposed to sunlight
C. Finish: One coat of Tnemec Series 73 Endurashield, DF = 3.0

PART 3 - EXECUTION

3.01 GENERAL

A. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. The intent of the coating systems is to obtain smooth, clean, dry and well protected surfaces.

B. All coating and painting shall conform to applicable standards of the National Association of Corrosion Engineers and the Steel Structures Painting Council Manual. Material applied prior to approval of surface by the Engineer shall be removed and reapplied at the expense of the Contractor to the satisfactions of the Engineer.

C. Dust, dirt, oil, grease or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in a grease solvent and wiped with clean dry rags. Slag and weld metal accumulation and spatters shall be removed by chipping and grinding. All sharp edges shall be peened, ground or otherwise blunted as required by the Engineer.

D. Painting systems include surface preparations, prime coatings and finish coatings. Unless otherwise specified, prime coat-coatings shall be field applied. Where prime coatings are shop applied, they shall be thoroughly cleaned and touched up in the field as specified. Any off site work which does not conform to this specification is subject to rejection by the Engineer.

E. The Contractor's coating and painting equipment shall be designed for the application of the materials specified and shall be maintained in first class working order. The Contractor's equipment shall be subject to approval of the Engineer.

F. Application of the first coat shall follow immediately after surface preparation and cleaning and within an eight-hour working day. Any cleaned areas not receiving first coat within or right after the first hour period shall be re-cleaned prior to application of first coat.

G. Prior to assemble, all surfaces that are inaccessible after assembly, shall be prepared as specified herein and shall receive the paint or coating system specified.

H. Drop cloths shall be used to protect floor and adjoining work from splatter. Any paint surface damaged shall be repaired to the satisfaction of the Engineer before the work will be accepted. The lines formed by changes in color of coatings shall be neat and straight.

3.02 SURFACE PREPARATION

A. General:

1. All surfaces to be painted shall be prepared in a workmanlike manner with the objective of obtaining a clean and dry surface. Surfaces shall be cleaned of all oil, rust, grease, dust, scale, and other foreign substances that may inhibit bonding.
2. Field blast cleaning for all surfaces shall be dryblasted unless otherwise directed. Maximum particle size of abrasives shall be that which will produce a profile in accordance with recommendations of the coating manufacturer.

B. All interior and exterior welded and abraded steel shall be sandblast cleaned in conformance with SSPC Section SP10 (Near White Blast Cleaning).

C. Shop-Primed Ferrous Metal: Contractor shall be responsible for compatibility of the applied shop primer and the proposed field primer. If primers are compatible, all surfaces shall be cleaned in conformance with the manufacturers data sheet. If shop primer is not compatible, or damage to shop applied primer is too extensive for field touch-up, the surfaces shall be sandblasted in conformance to the surface preparation used in the shop.

D. Shop Finished Ferrous Metal: Factory finished equipment or materials which have suffered damage to the shop applied coatings during shipment or installation shall be roughed-up in the field. All surfaces shall be cleaned in conformance with SSPC Section SP2 and touch-up shall be performed with paint supplied by the manufacturer.

E. Immersion Service Ferrous Metal: Surfaces shall be sandblasted to a "Near White Clean" SP10 before application of the primer.

F. Non-Ferrous Metal: Surfaces to be painted shall be cleaned in conformance with SSPC Section SP1 (Solvent Cleaned).

G. Galvanized Metals: Galvanized surfaces to be painted shall be cleaned in conformance with SSPC Section SP1. Before application of the primer, surfaces shall be treated with one coat Koppers 40 Passivator (WF=4.0, DF=0.4).

H. PVC Pipe: Surfaces shall be cleaned in conformance with SSPC Section SP1, except hand sanding shall be used to roughen the surface.

I. Pipe with Factory Applied Bituminous Coatings: All exposed ductile iron pipe shall be painted. Bituminous coating shall be removed by sand blasting to near white before application of primer.

J. Gypsum Wall Board: Cut out scratches, cracks, and abrasions in surfaces and openings adjoining trim and fill with approved filler. Bring filler flush with adjoining surfaces and when dry, sand smooth.

K. Masonry: Surfaces shall be reasonably smooth and free of voids, cavities, dirt, dust, oils, grease or other contaminants.

L. Concrete: Sweep sandblast to provide a surface profile. Allow concrete to cure for 28 days prior to painting.

3.03 COATING SYSTEMS APPLICATION

A. All coatings shall be applied in strict accordance with the manufacturer's printed instructions and recommendations.

B. All coatings shall conform to the film thicknesses as specified in Part 2 of this section. Coatings failing to meet the minimum dry film thickness shall be given additional coats until the minimum film thickness is attained.

C. Undercoats shall be tinted similar to the finish coats. Each coat shall be slightly darker than the preceding coat.

D. Each coat applied shall be inspected and approved by the Engineer before application of the succeeding coat.

E. Allow each coat to dry thoroughly before applying the next coat.

F. Finish coats shall be uniform in color and sheen without streaks, laps, runs, sags or missed areas.

3.04 CONTRACT CLOSE-OUT

A. The Engineer shall make a detailed inspection of the paint work upon completion. All damage to surfaces resulting from the work of this section shall be cleaned, repaired or refinished as necessary, at no cost to the Owner.

B. Upon completion of the work, all paint equipment and materials shall be removed from the site. Coating or paint spots, oil or stains upon adjacent surfaces shall be removed and the job site cleaned.

END OF SECTION

SECTION 09910 – CONCRETE PROTECTIVE COATING

PART 1 - GENERAL

1.01 SURFACES TO BE COATED

A. This specification covers work, materials and equipment required for protecting all interior surfaces of the new 8-foot diameter pump station pre-cast concrete wet well by spray-application of a monolithic high-build epoxy coating to eliminate infiltration, provide corrosion protection, repair voids and enhance structural integrity. Procedures for surface preparation, cleaning, application and testing are described herein.

1.02 SUBMITTALS

A. The following items shall be submitted:

1. Technical data sheet on each product used, including ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.

2. Material Safety Data Sheets (MSDS) for each product used.

3. Project specific guidelines and recommendations.

4. Applicator Qualifications:

   a. Manufacturer certification that Applicator has been trained and approved in the handling, mixing and application of the products to be used.

   b. Certification by the protective coating manufacturer that the equipment to be used for applying the products has been approved and Applicator personnel have been trained and certified for proper use of the equipment.

   c. Five (5) recent references of Applicator (projects of similar size and scope) indicating successful application of a high-build solvent-free epoxy coating by spray application.

   d. Proof of any necessary federal, state or local permits or licenses necessary for the project.

1.05 QUALITY ASSURANCE

A. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE and SSPC standards and the protective coating manufacturer's recommendations.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Materials are to be kept dry, protected from weather and stored under cover.

B. Protective coating materials are to be stored between 50 deg F and 90 deg F. Do not store near flame, heat or strong oxidants.

C. Protective coating materials are to be handled according to their material safety data sheets.

1.07 SITE CONDITIONS

A. Applicator shall conform with all local, state and federal regulations including those set forth by OSHA, RCRA and the EPA and any other applicable authorities.

PART 2 - PRODUCTS

2.01 EXISTING PRODUCTS

A. Standard Portland cement or new concrete (not quick setting high strength cement) must be well cured prior to application of the protective coating. Generally, 28 days is adequate cure time for standard Portland. If earlier application is desired, compressive or tensile strength of the concrete can be tested to determine if acceptable cure has occurred. (Note: Bond strength of the coating to the concrete surface is generally limited to the tensile strength of the concrete itself.)

B. Cementitious patching and repair materials should not be used unless their manufacturer provides information as to its suitability for topcoating with an epoxy coating. Project specific submittals and procedures should be provided including application, cure time and surface preparation procedures that permit optimum bond strength with the epoxy coating.

2.02 MANUFACTURER

A. Raven Lining Systems, Inc., Tulsa, Oklahoma 800-324-2810 or 918-584-2810 or FAX 918-582-4311.

2.03 REPAIR MATERIALS

A. Repair materials shall be used to fill voids, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the engineer and protective coating applicator. Repair materials must be compatible with the specified epoxy coating and shall be applied in accordance with the manufacturer's recommendations.

B. As an example, the following products may be accepted and approved by the protective coating manufacturer and could be used within the specifications:

1. 100% solids, solvent-free epoxy grout that can be troweled or sprayed and specifically formulated for optimum epoxy topcoating compatibility. The epoxy grout manufacturer shall provide instructions for epoxy topcoating procedures.

2.04 PROTECTIVE COATING MATERIAL

A. Raven Lining Systems' 405 Series epoxy coating system - a 100% solids, solvent-free two-component epoxy resin system thixotropic in nature and filled with select fillers to minimize permeability and provide sag resistance.

Product type	Amine cured epoxy
Color	Light Blue
Solids Content (vol %)	100

2.05 PROTECTIVE COATING APPLICATION EQUIPMENT

A. Manufacturer heated plural component spray equipment shall be used in the application of the specified protective coating.

PART 3 - EXECUTION

3.01 ACCEPTABLE APPLICATORS

A. Protective coating must be applied by a Certified Applicator of the protective coating manufacturer and according to manufacturer specifications.

3.02 EXAMINATION

A. Appropriate actions shall be taken to comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety.

B. Installation of the protective coating shall not commence until the concrete substrate has properly cured and been prepared in accordance with these specifications.

C. Temperature of the surface to be coated should be maintained between 40° F and 120° F during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, care should be taken to apply the coating when the surface temperature is falling versus rising.

3.03 SURFACE PREPARATION

A. Applicator shall inspect all surfaces specified to receive a protective coating prior to surface preparation. Applicator shall notify Owner of any noticeable disparity in the surfaces that may interfere with the proper preparation or application of the repair mortar and protective coating.

B. All contaminants including: oils, grease, unsound or incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.

C. All concrete that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface or replaced.

D. Surface preparation method(s) should be based upon the conditions of the substrate and the requirements of the epoxy protective coating to be applied.

Surfaces to receive protective coating shall be cleaned and abraded to produce a sound concrete surface with adequate profile and porosity to provide a strong bond between the protective coating and the substrate. Generally, this can be achieved with a low pressure water cleaning using equipment capable of 5,000 psi at 4 gpm. Other methods such as high pressure water jetting (refer to NACE Standard No. 5/SSPC-SP12), abrasive blasting, shotblasting, grinding, scarifying or acid etching may also be used. Detergent water cleaning and hot water blasting may be necessary to remove oils, grease or other hydrocarbon residues from the concrete.

E. Test prepared surfaces after cleaning but prior to application of the epoxy coating to determine if a specific pH or moisture content of the concrete is required according to manufacturer's recommendations.

F. All surfaces should be inspected during surface prep and before the repair mortar is applied.

3.04 APPLICATION OF REPAIR MATERIALS

A. Areas where structural steel has been exposed or removed shall be repaired in accordance with the Project Engineer's recommendations.

B. Repair materials shall meet the specifications contained herein. The materials shall be trowel or spray applied utilizing proper equipment on to specified surfaces. The material thickness shall be specified by the Project Engineer according to Owner's requirements and manufacturer's recommendations.

C. Cementitious repair materials shall be trowelled to provide a smooth surface with an average profile equivalent to coarse sandpaper to optimally receive the protective coating. No honeycomb surfaces should remain after the final trowel procedure of the repair mortar.

D. The repair materials shall be permitted to cure according to manufacturer recommendations.

E. All surfaces should be inspected during and after preparation and before the protective coating is applied.

3.05 APPLICATION OF PROTECTIVE COATING

A. Application procedures shall conform to the recommendations of the protective coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.

B. The spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order.

C. The protective coating material must be spray applied by a Certified Applicator of the protective coating manufacturer.

D. Specified surfaces shall be coated by spray application of a moisture tolerant, solvent-free, 100% solids, epoxy protective coating as further described herein. Spray application shall be to a minimum wet film thickness of 70 mils and an average wet film thickness of 80 mils.

E. Airless spray application equipment approved by the coating manufacturer shall be used to apply each coat of the protective coating. Air assisted spray application equipment may be acceptable, especially for thinner coats (<10 mils), only if the air source is filtered to completely remove all oil and water.

F. If necessary, subsequent topcoating or additional coats of the protective coating should occur as soon as the basecoat becomes tack free, ideally within 12 hours but no later than the recoat window for the specified product. Additional surface preparation procedures will be required if this recoat window is exceeded.

3.06 TESTING AND INSPECTION

A. During application a wet film thickness gage, such as those available through Paul N. Gardner Company, Inc. meeting ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to ensure a monolithic coating and uniform thickness during application. The applicator shall supply the gage for use by the Owner’s Inspector.

B. A final visual inspection shall be made by the Inspector and manufacturer's representative. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by Applicator.

END OF SECTION

SECTION 11100 - PUMP STATION EQUIPMENT

PART 1 - GENERAL

1.01 Description

This work shall consist of constructing the Sewage Pump Station No.4 Improvements as shown on the plans and described herein. The pump station will be upgraded and will serve the City of Ferndale.

Submittals shall include the following:
a. Brochures and certified pump curves.
b. Shop Drawings.
c. Catalog information and cuts.
d. Manufacturer's specifications and equipment drawings.
e. Manufacturer's parts lists, schematic and wiring diagrams.
f. Complete lubrication, maintenance, and operation instructions.
g. Control panel submittals including wiring diagram and panel layout.
h. Interconnection wiring showing field wiring.
i. Copy of manufacturer's warranty for pumps.
j. Factory test report.

PART 2 - PRODUCTS

Pump Station #4

Each of the PS #4 pumps shall be capable of pumping 1250 gpm at 98 feet TDH with an efficiency of 70% or greater. Additional operation points are: 800 gpm @ 117 feet TDH, 1340 gpm @ 94 feet TDH, and 2300 gpm @ 50 feet TDH. Each pump shall be equipped with a submersible 480 volt, 3 phase, 60 hertz electric motor of sufficient horsepower to be non-overloading throughout the entire pump curve and shall not exceed 60 horsepower. The pumps shall be Flygt NP 3202 HT, 460 (294 mm) impeller, 6” discharge, 1775 RPM. Impellers and backplates are to be hardened iron (high chrome iron) and designed for abrasive wastewater environments. In addition, provide and install one flush/mix valve for pump system.

Pump Manufacturer

The pumps shall be manufactured by Flygt. Pumps are to have “N” style non-clog impellers and pump curves as specified.

Pump Construction

Major pump components shall be of gray cast iron, ASTM A-48, Class 35, with smooth surfaces devoid of blow holes or other irregularities. All exposed fasteners shall be ASTM A 276 Type 316stainless steel. All metal surfaces coming into contact with the pumpage shall be protected by an alkyd paint system. The pump shall be coated with a two-component epoxy finish having at minimum 83% solids by volume. This coating shall be non-toxic and approved for both wastewater and water applications.

The power cable shall be suitable for the submersible application and sized in accordance with NEC requirements. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered equal.

If a triple sealed cable entry as described is not utilized in the pump's design, then the pump shall have installed a separate moisture sensor mounted in the terminal area to shut the pump down should moisture approach the high voltage terminal area.

The pump motor shall be induction type with a squirrel cage rotor, housed in an air filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class H insulation rated for 356°F. The motor shall have a minimum service factor of 1.15.

The power cable shall be sized according to NEC and ICEA standards and shall be of sufficient length to reach the junction box without splices. Cable jacket shall be polyethylene.

The pump system including the pump, motor and power cable shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class I, Div. 1, Group C and D service as determined and approved by the U.L. or Factory Mutual testing agencies.

The pump system shall be approved for use with pumpage of 104 degrees Fahrenheit.

The motors shall be designed, rated, and warranted for continuous operation and capable of at minimum thirty (30) starts per hour. Temperature monitors shall be embedded in the motor windings for use in conjunction with and supplemental to external motor overload protection. The pump's control shall shut down the pump should any of the monitors detect high temperature and automatically reset once motor temperature returns to normal. Do not provide a motor that contains other than ecologically safe paraffin base oil in the seal chamber. Do not provide motors containing di-electric oils used for motor cooling and/or bearing lubrication.

Motor bearings shall be permanently grease lubricated and shall have a minimum calculated L10 bearing life of 50,000 hours.

Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the

seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

Provide a common pump/motor shaft of sufficient size to transmit full driver output with a maximum deflection of 0.002 inches measured at the lower mechanical seal. The shaft shall be completely of at minimum ASTM A 276 Type 431 stainless steel. Do not use carbon steel as shaft material without using a stainless steel shaft sleeve.

The impellers shall be of Hard Iron(ASTM A-532 (Alloy III A) 25% chrome cast iron) dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the gray iron impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

Pumps shall have temperature protection and leak detection. Temperature protection shall be thermal switches in all stators which open at 260°F, stop the motor and activate an alarm. Provide a sensor in the motor's stator cavity which allows a control panel mounted relay to indicate leakage into the motor.

Each pump shall have a cast iron discharge elbow mounted to the wet well floor using anchor bolts sized and installed in accordance with the pump manufacturer's recommendation.

2.2 Pump Removal Equipment

Provide and install Type 304 stainless steel guide bars, brackets, and Type 316 Stainless steel lifting chain. There shall be a minimum of two guide bars for each pump.

2.3 Access Hatches

Provide and install in a concrete lid an aluminum access hatch in accordance with pump manufacturer's size requirements and pump station plans to allow direct pump removal. Hatches shall be aluminum diamond pattern plate rated for H-20 loading. Hatches shall be equipped with a recessed padlock hasp and automatic hold-open arm with release handle.

2.4 Valves

Provide and install valves as shown on plans. See Section 15300-Valves for detailed requirements.

2.5 Electrical and Control Equipment

Provide and install control panels, float switches, and related electrical and control equipment for the pump stations. See Electrical Specification for detailed requirements.

PART 3 - EXECUTION

3.1 Piping

The types and sizes of pipes to be used shall be as specified and shown on the plans. The interior of piping shall be cleansed before assemble and connection. Perform cutting of pipe and fittings and furnish and install all fittings necessary for proper and accurate assemble, erection and completion of the work. Pipe shall be cut to fit accurately with smooth edges and faces. Flanged joints shall be square with even pressure on gaskets.

3.2 Pumping Units

Pumping units shall be installed as shown on the Plans and in accordance with all manufacturer's recommendations. The Contractor shall protect the power lead to pump motor connection and shall be responsible for maintaining the connection water tight.

3.3 Float Switches

Float switches shall be suspended at levels as shown on the Plans. Suspension cables shall be secured on the cable holder forming a large loop such that conductors in the cable shall not be squeezed tight. In addition, please note that a submersible level transducer will also be used for pump control.

3.4 Aluminum Access Hatches

Access hatch frames shall be cast into the top slabs of the structure. Installations shall be in accordance with all of the access hatch manufacturer's recommendations. The aluminum access hatches shall be manufactured by Syracuse Castings, or approved equal.

3.5 Testing

The following inspections and tests shall be performed by the manufacturer prior to shipping and a written quality assurance record confirming the tests/inspections shall be supplied with each pump:

Impeller, motor rating and electrical connections shall be checked for compliance with this specification.
Prior to submergence, each pump shall be run dry to establish correct rotation.
Each pump shall be run submerged in water.
Motor and cable insulation shall be tested for moisture content or insulation defects.

3.6 Start-Up Services

The equipment manufacturer shall furnish the services of a qualified factory trained field service engineer for two 8-hour days at the site to inspect the installation and instruct the Owner's personnel on the operation and maintenance of the pumping units. After the pumps have been completely installed and wired, the Contractor shall do the following tests under the supervision of the manufacturer’s representative:

Megger stator and power cables.
Check seal lubrication.
Check for proper rotation.
Check power supply voltage.
Measure motor operating load and no load current.
Check level control operation and sequence.
Demonstrate to the owner each pump being lifted out of the wet well and then reinstalled, using the lifting chain.

In addition, Contractor is required to provide any additional information needed by the pump supplier to validate pump warranties (i.e. voltage and amp readings for each leg of line).

3.7 Warranty

In addition to 1 year warranty from date of substantial completion, provide the pump manufacturers guarantee in printed form and previously published as the manufacturer's standard warranty for all similar units manufactured. The prorated guarantee shall cover the pumps against defects in workmanship and material for a minimum of five (5) years or 10,000 hours of operation under normal use and service.

*** END OF SECTION***

SECTION 15010 - BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. The requirements of this Section apply to all the Work of Division 15.

B. Provide a complete working installation with all equipment called for in proper operating condition. Documents do not undertake to show or list every item to be provided. When an item not shown or specified is clearly necessary for proper operation of equipment shown or specified, provide an item which will allow the system to function properly at no increase in Contract Sum.

1.02 SUBMITTALS

A. General:
1. Submittals shall be in accordance with requirements of Division 1 and as specified.
2. Forward all submittals to the Engineer, together, at one time. Individual or incomplete submittals are not acceptable.
3. Organize submittals in same sequence as they appear in Specification Sections.
4. Identify each submittal item by reference to Specification Section paragraph in which item is specified, or Drawing and Detail number.
5. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.

B. Shop Drawings:
1. Show physical arrangement, construction details, finishes, materials used in fabrication, provisions for piping entrance, access requirements for installation and maintenance, physical size, and mechanical characteristics.
2. Catalog cuts and published material may be included to supplement Shop Drawings.

C. Contract Closeout Submittals:
1. Operation and Maintenance:

Subsequent to completion of balancing, and testing operations, instruct Owner's authorized representatives in operation, adjustment, and maintenance of mechanical systems.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Nothing in the Drawings or Specifications shall be construed to permit Work not conforming to applicable laws, ordinances, rules or regulations.
2. When Drawings or Specifications exceed requirements of applicable laws, ordinances, rules, or regulations, comply with documents establishing the more stringent requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Ship equipment in its original package to prevent damage or entrance of foreign matter. Perform all handling and shipping in accordance with manufacturer's recommendations. Provide protective coverings during construction.

B. Identify materials and equipment delivered to the Site to permit check against approved materials list, and reviewed submittals.

1.05 PROJECT CONDITIONS

A. Equipment Rough-in:
1. Rough-in locations for equipment furnished under other Divisions and for equipment furnished by Owner are approximate only. Obtain exact rough-in locations from the following sources:
a. From Shop Drawings for Contractor provided equipment.
b. From Architect for Owner furnished, Contractor installed equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials and Equipment General Requirements:
1. All items of materials in each category of equipment shall be of one manufacturer.
2. Groups of items having same or similar function shall be by single manufacturer to facilitate maintenance and service.
3. Compatible with space allocated. Modifications necessary to adjust items to space limitations shall be at Contractor's expense.
4. Conform with conditions shown and specified. Coordinate with other trades for best possible assembly of completed Work.
5. Installed fully operating without objectionable noise or vibration.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Follow manufacturer's directions in all cases where manufacturers of articles used furnish directions covering points not shown or specified.

B. Accurately set and level equipment with supports neatly placed and properly fastened. No allowance of any kind will be made for negligence on the part of the Contractor to foresee means of bringing in and installing equipment in position inside the building.

C. Piping Systems:
1. Work into complete integrated arrangement with like elements. Make Work neat and finished appearing.
2. Run concealed, except where shown otherwise. Where exposed run parallel with walls or structural elements with vertical runs plumb, horizontal runs level or uniformly pitched as appropriate.
3. Flash and counterflash all penetrations through roof in accordance with requirements of Section 07600 and as shown.
4. Make adequate provisions for expansion and contraction whether those provisions are shown or not.

D. Provide hangers, supports, anchors and chases as required for installation of Mechanical Work.

E. Excavating and Backfilling: In accordance with requirements of Division 2. Provide all necessary shoring, sheeting, and pumping as part of Work of this Division.

F. Concrete: In accordance with requirements of Division 3.

G. Interface with other products:
1. Exact routing of piping and other items shall be governed by structural conditions or obstruction. Contractor shall make use of data in Contract Documents. In addition, Architect reserves right, at no increase in Contract Sum, to make any reasonable change in location of mechanical items exposed at ceilings or on partitions to group them in orderly relationships or to increase their utility. Verify requirements in this regard prior to roughing-in.
2. Take dimensions, location of doors, partitions, and similar features from Architectural Drawings. Verify at the Site under this Division. Consult Architectural Drawings for exact location of outlets, and other items to center with architectural features.

3.02 FIELD QUALITY CONTROL

A. Test Mechanical systems in portions as Work progresses.

3.03 CLEANING

A. Properly prepare Work under this Division to be finish painted under Section 09900.

B. Thoroughly flush out domestic water piping with domestic water under pressure before faucets, flush valves, and other constantly operated devices are installed.

3.04 EQUIPMENT IDENTIFICATION

A. Properly identify piping, and equipment.

*****END OF SECTION*****

SECTION 15100 - PIPING

PART 1 - GENERAL

1.01 SCOPE OF WORK

This section covers the work necessary to furnish and install the Pump Station piping. Detailed materials and work for each pipe type are specified in the Detail Piping Specifications which are incorporated as part of this section. The pipe system to be used for each process system is shown on the plans.

For trench excavation, backfill, pipe bedding, and material placed in the pipe zone, see Section TRENCH EXCAVATION AND BACKFILL.

See Division 1 GENERAL, which contains information and requirements that apply to the work specified herein and are mandatory for this project.

The Contractor shall furnish and install pipe and fittings as shown on the Drawings and as specified in these Specifications. The pipe shall be new, manufactured in accordance with these Specifications and Drawings.

Piping systems, including pipe, fittings, anchors, and all other elements, shall be detailed, fabricated, and installed to resist all internal and external loads which will be imposed upon them. Pressure ratings and materials stated in these Piping Specification sections are minimum acceptable standards. Systems shall be suitable for the service intended.

The pipe diameters shown on the Drawings and used in these Specifications are inside diameters unless specific reference is made to outside diameter of the pipe or the pipe is a standardized product normally designated by a nominal size, e.g., ductile iron pipe.

1.02 SUBMITTALS DURING CONSTRUCTION

Submittals during construction shall be made in accordance with Sections 01300 and 01340 in Division 1, GENERAL REQUIREMENTS. In addition, the following specific information shall be provided.

FIELD FABRICATION

For pipelines which are assembled in the field from standard fittings, submit complete data on pipe, fittings, linings, coatings, and any manufacturer's installation instructions.

FABRICATION AND LAYING DRAWINGS

For shop fabricated piping, the Contractor shall furnish the Engineer with pipe design calculations, the required test data, and shop drawings which shall include a laying plan and details of pipe sections, special fittings, and bends. Dimensions, coatings, and other pertinent

information shall be shown. The laying plan shall show the location of each pipe section and each special length, with each piece numbered or otherwise designated in sequence. All outlets and bends shall be made up into special lengths so that, when installed, they will be located as indicated. Each pipe and fitting shall be marked on the outside to indicated the class of pipe, location number on the laying plan, size or diameter, manufacturer's identification, and date of manufacture. Pipe shall be furnished and installed in accordance with the reviewed laying plan.

PIPE SUPPORT DRAWINGS

Drawings of each major piping system locating each support and hanger. Drawings shall identify the support type by catalog number or shop drawing detail number and show anchor locations, identifying them by shop drawing detail number.

MATERIAL CERTIFICATION

Certification of all materials, and manufacturing properly executed by the manufacturer, shall be available to show compliance with the Specification of materials being furnished. Test data on tests performed shall be provided as requested by the Engineer.

FIELD WELDING PROCEDURE

Details of welding procedures for each type of field weld, including base metal, welding method, electrodes, preheating requirements, and other data.

PLUMBING CODE

All sanitary building drainage and vent systems shall conform to the plumbing laws, rules, and regulations of the state and of the city, whichever represents the higher standard.
The Owner will obtain any variances imposed by site constraints.

PART 2 - PRODUCTS

GALVANIZING

Where galvanizing is specified it shall be hot-dip applied only. Electroplated zinc or cadmium plating is unacceptable.

PAINTING

All exposed piping, except copper, stainless steel, and galvanized, shall be painted as specified in Section 09900 PAINTING.

SLAB, FLOOR, WALL, AND ROOF PENETRATIONS

All ductile iron penetrations of slabs, floors, walls, and roofs shall be poured in place ductile iron wall pipe. It shall be the Contractor's responsibility to verify the size and location of all building and structure penetrations prior to pouring concrete. All sleeves shall be supported by form work to prevent contact with the reinforcing steel.

STRUCTURAL CONCRETE WALL PENETRATIONS

Metal pipe wall penetrations shall use ductile iron Omni-Sleeve with EPDM gaskets. PVC pipe wall penetrations shall use GPK Products sand collars.

PRECAST MANHOLE/VAULTS WALL PENETRATION SEALS

Manhole pipe wall penetrations shall be constructed by coring and sealing with Link-seal modular seals.

FLEXIBLE COUPLINGS

Except as noted, flexible couplings for use with steel pipe shall be Dresser, Style 38; Rockwell, Style 411; or equal. Flexible couplings for use with ductile iron pipe shall be Dresser, Style 53 or 153; Rockwell, Style 431; or equal. Depend-o-Lok type ExE, FxF, or FxE couplings as manufactured by Brico Industries may be used as an alternate to flexible couplings on steel, stainless steel, or ductile iron pipe. Bolts and nuts for buried or exposed conditions shall be zinc coated. Bolts and nuts for submerged conditions shall be Type 316 stainless steel. High-strength low-alloy steel in accordance with AWWA C111 may be substituted for zinc-coated nuts and bolts on cast or ductile iron couplings. Thrust ties shall be provided as required or shown, to sustain the force developed by 1-1/2 times the operating pressure specified. Steel middle rings shall be fusion epoxy lined and coated in accordance with Section PAINTING, System No. 29. Ductile iron sleeves with mechanical joints at each end may be substituted for flexible couplings on ductile iron pipe.

RUBBER GASKET STORAGE

Store all rubber gaskets in a cool, well-ventilated place, and do not expose to the direct rays of the sun. Do not allow contact with oils, fuels, or petroleum solvents.

JOINT LUBRICANT

Furnish joint lubricant with the pipe. Furnish the amount and type recommended by the pipe manufacturer. The lubricant shall be a water-soluble, nontoxic, vegetable soap compound conforming to United States Pharmacopoeia No. P39.

HYDROSTATIC TESTING

Provide all hoses, plugs, and other necessary equipment to complete the tests.

PIPE INSULATION

All above grade pipe which transports water shall be insulated with flexible elastomeric thermal insulation (Insul-Tube 1800 or Insul-Sheet 1800 manufactured by Rubatex Corporation). Insulation to be 1" thick (minimum), designed for cold pipe fitting systems, installed per manufacturers recommendation, and to have a maximum thermal conductivity K factor@75˚ of 0.264 (BTU/hr/sf/˚F/in). Contact adhesive for insulation is to be an air drying solvent based neoprene contact adhesive (Rubatex R-373 Contact Adhesive).

Fitting covers are to be installed over all exposed insulation to provide complete jacketing for all insulated piping and to provide excellent durability. Covers are to be UV resistant, white, 1or 2 piece pre-molded high impact PVC fitting covers with accessories. Covers are to be designed for straight piping runs, tees, elbows, valves, mechanical line couplings, and specialty fittings. Fitting covers are to be Proto – EXOTUFF FITTING COVERS, or approved equal.

Contact Cork Insulation (253-239-2675).

PART 3 - EXECUTION

SHIPPING AND HANDLING MATERIALS

During transportation, unloading, and storage, pipe and materials shall be protected, supported, and handled in a manner to prevent damage to the materials, especially linings and coatings. Only implements and equipment suitable for proper and safe handling of the materials shall be used. Fabric slings shall be used to lift pipe and fittings, not chains or cables.

PIPE PREPARATION AND HANDLING

Each pipe and fitting shall be carefully inspected before the exposed pipe or fitting is installed or the buried pipe or fitting is lowered into the trench. The interior and exterior protective coating shall be inspected, and all damaged areas parched in the field with material similar to the original, except damaged glass-lined pipe. Any damaged glass-lined pipe shall not be used and shall be promptly removed from the plant site. Any pipe which, in the opinion of the Engineer, is damaged beyond repair shall be removed from the site and replaced with another unit. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after installation.

Use proper implements, tools, and facilities for the safe and proper protection of the pipe. Carefully handle pipe in such a manner as to avoid any physical damage to the pipe. Do not drop or dump pipe from trucks or into trenches under any circumstances. All pipe fittings and

appurtenances shall be installed in accordance with the manufacturer's instructions and these Specifications.

CUTTING AND FABRICATING

Cut pipe with approved cutters, do not flame cut except for mild steel pipe. Cut perpendicular to axis of pipe. Dress ends to suit type of joint being made, removing burrs, mill scale, and debris before making up. Repair damaged linings and coatings.

BELL HOLES

Excavate bell holes at each joint to permit proper assembly and visual and feeler gauge inspection of the entire joint.

EXPANSION PROVISIONS

Provisions shall be made for the expansion and contraction which may occur in pipe due to temperature change. Pipe expansion provisions are not completely detailed on the Drawings. The absence of these details on any Drawing shall not relieve the Contractor of the responsibility for providing them where required, and at his sole expense.

PIPE IN CONCRETE ENCASEMENTS OR CONCRETE BEDDING

Except for welded joints, pipe joints shall not be encased in concrete unless specifically required on the Drawings. Pipe coatings shall be continuous through concrete encasements, thrust blocks, anchors, collars, etc., unless otherwise shown on the Drawings.

FLEXIBLE JOINTS AT CONCRETE BACKFILL OR ENCASEMENT

Except for welded joint pipe, a flexible joint shall be provided within 18 inches or one-half the pipe diameter, whichever is less, from the terminations of any concrete backfill or concrete encasement.

FLEXIBLE JOINTS AT CONCRETE STRUCTURES

Unless shown otherwise on the plans, a flexible joint shall be provided at the face of all manholes or other structures. The joint may be flush with the face, may be up to one half pipe diameter away from the face, but shall not be more than 18 inches away from the face.

A second flexible joint shall be provided within 18 inches of the first joint for pipelines smaller than 18 inches in diameter or within one pipe diameter of the first joint for pipelines larger than 18 inches in diameter.

Flexible joints may be rubber ring joints, mechanical joints, flexible couplings, grooved couplings, or Brico Depend-o-Lok couplings.

LINE AND GRADE

Grade the bottom of the trench by hand, if necessary, to the line and grade to which the pipe is to be laid, with proper allowance for pipe thickness and for base. Remove hard spots that would prevent a uniform thickness of base or uniform pressure on the pipe barrel.

Lay pipe to a uniform grade between indicated elevations. Do not deviate more than 1 inch from line or 1/4 inch from established grade. Measure for grade at the pipe invert.

Before laying each section of pipe, check the grade with as straightedge and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

PERMISSIBLE DEFLECTION AT JOINTS

Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, do not exceed 75 percent of the amount of deflection recommended by the pipe or coupling manufacturer.

LAYING AND JOINTING PIPE AND FITTINGS

After a section of pipe has been lowered into the prepared trench, clean the end of the pipe to be joined, the inside of the joint, and the rubber ring immediately before joining the pipe. Make assembly of the joint in accordance with the recommendations of the manufacturer. Provide all special tools and appliances required for the jointing assembly.

The gasket position shall be checked with a feeler gauge, furnished by the pipe manufacturer, to assure proper seating. After the joint has been made, check pipe for alignment and grade. After sufficient pressure in making the joint to assure that the joint is "home", as defined in the standard installation instructions provided by the pipe manufacturer. To assure proper pipe alignment and joint makeup, place sufficient pipe zone material to secure the pipe from movement before the next joint is installed.

Take the necessary precautions required to prevent excavated or other foreign material from entering the pipe during the laying operation. At all times, when laying operations are not in progress, at the close of the day's work, or whenever the workmen are absent from the job, close and block the open end of the last laid section of pipe to prevent entry of foreign material or creep of the gasketed joints.

Take all precautions necessary to prevent the "uplift" or floating of the line prior to the completion of the backfilling operation.

When cutting and/or machining the pipe is necessary, use only tools and methods recommended by the pipe manufacturer.

UNSUITABLE CONDITIONS FOR LAYING PIPE

Do not lay pipe in water, or when in the opinion of the Engineer, trench conditions are unsuitable.

PREVENTING TRENCH WATER FROM ENTERING PIPE

When the pipe laying is not in progress, close the open ends of pipe by approved means, and do not permit trench water or other foreign material to enter the pipe. Keep water out of the trench.

INSTALLATION OF EXPOSED PIPING

Unless shown otherwise, piping shall be parallel to building lines. Hangers on adjacent piping shall be aligned where possible on common size ranges.

All pipe flanges shall be set level, plumb, and aligned. All flanged fittings shall be true and perpendicular to the axis of the pipe. All bolt holes in flanges shall straddle vertical centerline of pipes.

Unions shall be installed where required for piping or equipment installation, even though they are not shown on the Drawings.

Piping shall be installed without springing or forcing the pipe in a manner which would set up stresses in the pipe, valves, or connected equipment.

Required straight runs of piping upstream and downstream of flow measuring devices shall be smooth.

ANCHORAGE AND EXPANSION PROVISIONS

All piping shall be anchored against thrust developed by internal pressures. In addition, provisions shall be made for the expansion and contraction which may occur in pipe due to temperature change. Pipe anchorage and expansion provisions are not completely detailed on the Drawings. The absence of these details on any Drawings shall not relieve the Contractor of the responsibility for providing them where required.

VENTS AND DRAINS

Vent the high point and drain the low point of all pipelines, whether shown on the Drawings or not, with 3/4-inch gate valves on those pipelines 2-1/2-inch and larger and 1/2-inch gate valves on those pipelines 2-inch and smaller. Valve types shall be selected for the service to be vented and drained.

INSTALLATION OF FLEXIBLE COUPLINGS, FLANGED COUPLING ADAPTERS, GROOVED JOINT COUPLINGS, DEPEND-O-LOK COUPLINGS, AND SERVICE SADDLES

Prior to installation, thoroughly clean oil, scale, rust, and dirt from the pipe to provide a clean seat for the gasket. Care shall be taken that the gaskets are wiped clean before they are installed. If necessary, flexible couplings and flanged coupling adapter gaskets may be lubricated with soapy water or manufacturer's standard lubricant before installation on the pipe ends. Install in accordance with the manufacturer's recommendations. Bolts shall be tightened progressively, drawing up bolts on opposite sides a little at a time until all bolts have a uniform tightness. Workmen tightening bolts shall use torque-limiting wrenches.

Flexible couplings with tie rods may be used to tie pipes against thrust. They shall not be used, with or without tie rods, as expansion joints on pipelines with cyclic temperature changes. Readjust tie rod tension after initial filling before pressure testing. Depend-o-Lok type FxF couplings as manufactured by Brico Industries may be used in lieu of flexible couplings with tie rods.

CORROSION PROTECTION OF PIPE AND ACCESSORIES

Not all corrosion protection details are included, either on the Drawings or in the Specifications. The absence of specific details on corrosion and environmental protection measures shall not relieve the Contractor of the responsibility of providing them, all as part of the Contract price.

CORROSION PROTECTION FOR BURIED PIPE ACCESSORIES

All buried pipe appurtenances made of steel shall have corrosion protection. Tie rods and similar items shall be heat shrink tube wrapped. Flange bolts, nuts, and similar items shall be coated with a bituminous paint or equal. Flexible couplings, grooved couplings, and similar items shall be heat shrink wrapped or cement coated.

Buried valves and similar elements on wrapped pipelines shall be bituminous paint-coated. On ductile iron or nonmetallic pipelines they shall have exposed nuts and bolts bituminous paint-coated and the entire valve wrapped in 8-mil polyethylene as specified for ductile iron pipe. On cement-coated pipelines they shall be cement-coated similar to detail shown for couplings.

TESTING

All of the yard piping and outfall sewer shall be tested in accordance with WSDOT specifications for Air Pressure Test for Sanitary Sewers Constructed of Non Air-Permeable Materials.

END OF SECTION

SECTION 15200 - PIPE, FITTINGS, AND HOSES

PART 1 GENERAL

1.01 SCOPE OF WORK

This section covers the work necessary to furnish and install water, wastewater, and air lines as shown on the plans and described herein, and in accordance with City of Ferndale development standards.

See Section 15100 PIPING and Section 15300 VALVES, for additional requirements.

PART 2 PRODUCTS

PRESSURE SEWER PIPE

Exposed:

Ductile Iron: AWWA C115, cement lined, thickness class 53 for flanged or grooved piping systems.

Buried:

Ductile Iron thickness class 50; unless flanged or grooved piping systems which are required to be thickness class 53 (as described above), or PVC, AWWA C900/C905, Class 150 (minimum), in accordance with City of Ferndale Development Standards and WSDOT Section 9-30.1. Or as noted on the plans

GRAVITY SEWER PIPE

PVC for wastewater applications:

ASTM D3034, SDR 35 for 4" through 15" pipe. ASTM F679, SDR 35 for 18" & larger pipe. Or as noted on the plans

Ductile Iron for wastewater applications:

WSDOT 9-05.13 Ductile Iron Sewer Pipe. Thickness class as shown on plans.

POTABLE WATER PIPE

Water main pipe between 4" and 12" is to be Ductile Iron with cement lining (certified under ANSI/NSF Standard 61 – Drinking Water System Components), thickness class 50 (unless flanged or grooved piping systems which are required to be thickness class 53) and in accordance with City of Ferndale Development Standards and WSDOT Section 9-30.1. Water service pipe 2" or less is to be type "K" copper in accordance with City of Ferndale Development Standards and WSDOT Section 9-30.1. All pipe

fittings are to be in accordance with City of Ferndale Development Standards and WSDOT Section 9-30.2.

JOINTS

BURIED PIPE

Mechanical or push-on joints to be in accordance with AWWA C111 for ductile iron pipe. Anchoring of mechanical joints with external set screws will not be permitted. PVC gravity pipe to be in accordance with ASTM D3212 - Specification for Joints, for Drain and Sewer Plastic Pipe using Flexible Elastomeric Seals.

EXPOSED PIPE

Flanged joints shall be in accordance with AWWA C115. Grooved and shouldered joints shall be in accordance with AWWA C-606.

FITTINGS

Cast or ductile iron in accordance with AWWA C110 and/or AWWA C153, short body type, 250 psi working pressure. Where taps are shown on fittings, tapping bosses shall be provided. PVC gravity pipe to be in accordance with ASTM D3034 or ASTM F679

CEMENT LINING

All ductile iron pipe and fittings shall be cement mortar lined and seal coated in accordance with ANSI A21.4/AWWA C104.

COATING

All ductile iron pipe to be buried shall receive a coat of bituminous material. All exposed ductile iron pipe (including all piping in valve vaults) is to be cleaned and shop coated with two coats of epoxy per Section 09900 Painting. All bituminous material on exposed piping is to be sand blasted off, prior to application of epoxy.

POLYETHYLENE ENCASEMENT FOR BURIED DUCTILE IRON PIPE

All ductile iron pipe (potable water pipe and sewer pipe) to be buried shall be protected with tubular polyethylene encasement (Polywrap, or equal).

GROOVED

Grooved couplings shall be Victaulic style 31 for ductile iron pipe, or equal. Couplings for steel or galvanized pipe shall be Victaulic style 07 for rigid systems or Victaulic style 77 for flexible systems. Grooved dimensions shall be per manufacturer's standards.

FLANGES

ANSI A21.15/AWWA C115, threaded, 250 psi working pressure, 125-pound ANSI drilling.

BOLTS

To be ASTM A 307, Grade A hex head bolts and nuts for Class 125 FF Flanges. Required Coatings:

Flanged Fittings Inside Building	Electroplated Steel Nuts & Bolts
Flanged Fittings Outdoor Exposed	Hot Dipped Galv. Steel Nuts & Bolts
Flanged Fittings Buried Underground	Manufacturer's Standard
Flanged Fittings in Contact W/ Sewage	316 Stainless Steel Nuts & Bolts
Buried T-Head	Cor-Ten Material
For Mechanical and Grooved Joints	Manufacturer's Standard, or provide bolt & nut material as described above, as a minimum requirement.

Or provide as noted on plans.

GASKETS

Gaskets for mechanical or push-on joints shall be rubber conforming to ANSI A21.11, AWWA C111.

All gaskets for ductile iron air piping shall be EPDM (Ethylene Propylene-Diene Monomer) material.

Gaskets for flanged joints in sewage or water service shall be 1/8 inch thick, cloth-inserted rubber conforming to applicable parts of ANSI B16.21 and AWWA C207. Gasket material shall be free from corrosive alkali or acid ingredients. Gaskets shall be one-piece, full-face, with holes to pass bolts. Gaskets for grooved joints shall be Flushseal type, halogenated butyle or nitrile depending on service.

Gaskets for PVC joints shall be elastomeric seals conforming to ASTM F477.

LUBRICANT

Lubricant for mechanical joint end piping shall be manufacturer's standard.

RESTRAINED JOINT PIPE

Joints for buried pressure pipe may be "restrained type". However, the use of restrained joints in lieu of thrust blocks will be acceptable only if the pipe configuration, soil conditions, and restrained length are suitable in the opinion of the Engineer.

PIPE SUPPORTS

Hot dip galvanized adjustable saddle supports with ¼" neoprene cushion under piping. Standon Model S92 Saddle Supports as supplied by Material Resources (503) 693-0727, or approved equal.

SERVICE SADDLES

Ford Iron Service Saddles, Style FC202 with stainless steel bands and epoxy coating, or approved equal.

PRESSURE GAGE FOR PUMP STATION FORCE MAIN

2.5" dial in a polypropylene case with a pressure range of 0 to 75 psi, 316 SS bourdon tube & socket, Marsh Marshalltown or equal. Include corrosion resistant diaphram seal, ITT Conoflow or equal. Provide fittings and adaptors as needed and isolate piping connections, to prevent contact between different types of metals.

PART 3 EXECUTION

HANDLING PIPE

Handle per manufacturer's recommendations. Take care not to damage lining when handling pipe.

CUTTING PIPE

Cut pipe with milling type cutter, rolling pipe cutter, or abrasive saw cutter. Do not flame cut. Do not damage linings. Cuts shall leave a smooth end at right angles to the pipe axis.

DRESSING CUT ENDS

Dress cut ends of pipe in accordance with the type of joint to be made. Dress cut ends of mechanical joint pipe to remove sharp edges or projections which may damage the rubber gasket.

Dress cut end of push-on joint pipe by beveling, as recommended by the pipe manufacturer.

Dress cut ends of pipe for flexible couplings and flanged coupling adapters as recommended by the coupling or adapter manufacturer.

FABRICATION OF FLANGED PIPE AND FITTINGS

Flanged pipe and fittings shall be fabricated in the shop, not in the field, and delivered to the job site with flanges in place and properly faced. Threaded flanges shall be individually fitted and machine tightened on the threaded pipe by the manufacturer. Flanges shall be faced after fabrication in accordance with AWWA C115.

JOINTING PIPE

FLANGED

Prior to connecting flanged pipe, the faces of the flanges shall be thoroughly cleaned of all oil, grease, and foreign material. The rubber gaskets shall be checked for proper fit and thoroughly cleaned. Care shall be taken to assure proper seating of the flange gasket. Bolts shall be tightened so that the pressure on the gasket is uniform. Torque-limiting wrenches shall be used to ensure uniform bearing insofar as possible. If joints leak when the hydrostatic test is applied, the gaskets shall be removed and reset and bolts retightened.

MECHANICAL, GROOVED, AND PUSH-ON JOINT

Join pipe with mechanical or push-on type joints in accordance with the manufacturer's recommendations. Tools and devices, such as special jacks, chokers, and similar items required for proper installation. Grooved systems may employ Victaulic field grooving tools, including cut and/or roll groovers as needed. Lubricant for the pipe gaskets shall be furnished by the pipe manufacturer, and no substitutes will be permitted under any circumstances.

SECTION 15200 - PIPE, FITTINGS, AND HOSES

WATER LINE CONSTRUCTION REQUIREMENTS

Trench excavation, bedding and backfill for water lines shall be installed per WSDOT 7-8 and WSDOT 7-9. All water lines shall be installed per WSDOT 7-9. Valves shall be installed per WSDOT 7-12. Fire hydrants shall be installed per WSDOT 7-14. Service connections shall be installed per WSDOT 7-15. Sanitary sewers shall be installed per WSDOT 7-17.

SPECIAL REQUIREMENTS FOR WATER LINES NEAR SEWER LINES

Construction requirements for water and sewer lines near sewer line either running adjacent to or crossing shall be in accordance with all requirements as specified in Washington State Department of Ecology, *Criteria for Sewage Works Design, C1-9 Special Requirements.*

WATER LINE TESTING AND DISINFECTION

All water mains and appurtenances shall pass a hydrostatic pressure test per WSDOT 7-09.3(23).

All water lines and appurtenances shall be chlorinated and dechlorinated in accordance with WSDOT Section 7-09.3(24) and a satisfactory bacteriological report obtained prior to placing in service.

END OF SECTION

SECTION 15300 - VALVES

PART 1 GENERAL

1.01 SCOPE

This section covers the work necessary for furnishing and installing the various valves in the pump station piping systems. See Section 15100-PIPING and Section 15200–PIPE, FITTINGS, AND HOSES for additional requirements.

SUBMITTALS DURING CONSTRUCTION

Submittals shall be made in accordance with Sections 01300.

PART 2 PRODUCTS

GENERAL

All valves shall be complete with all necessary operating handwheels, chain wheels, extension stems, floor stands, worm and gear operators, operating nuts, chains, and wrenches which are required for the proper completion of the work included under this section.

VALVE OPERATORS

All valve operators shall open by turning counterclockwise. Buried valve operators shall have AWWA C504 2-inch square operating nuts and be full enclosed, grease packed. All exposed valves shall have handwheel operators on valves within 6 feet of the floor and chainwheel operators on overhead valves. Depending upon valve type, size, and operating torques, gear operators shall be provided as needed so as to permit operation of the valve under full operating head with a maximum pull of 40 pounds on the handwheel. The valve operators shall be of the self-locking type to prevent the disc or plug from creeping. Self-locking worm gears shall be a one-piece design of gear bronze material, accurately machine cut. Butterfly valve operators shall be provided with position indicators to show the position of the valve disc or plug. Handwheels shall be galvanized and painted the same color as the valve and associated pipeline.

VALVE BOXES

Valve boxes shall be two-piece screw type, cast iron, with 5-1/4-inch shaft and shall be of appropriate length for the installation. Extension pieces, if required, shall be the manufacturer's standard type. Units shall be Mueller H-10364, Clow Corporation F-2452, or equal. All units shall be complete with all necessary bases and accessories. All buried valves are to be provided with valve box assemblies.

GATE VALVES

4" and larger gate valves are to be U.S. Pipe Metroseal 250, resilient-seated, conform to AWWA C509, transition gaskets where needed, fusion bonded epoxy coated inside and out meeting AWWA C550.

CHECK VALVES

Check valves are to be iron or ductile iron body, bronze mounted swing check valves, with external swing arm and spring, fusion bonded epoxy coated inside and out, meeting design per AWWA C-508. Valve shall be MH 259-02 Spring & Lever. External spring and lever shall be relocated to opposite side of valve, if directed by the City. Spring and lever relocation, if any, shall be considered incidental to Contractor's bid.

SMALL GATE VALVES

Gate valves smaller then 4" shall be rising stem threaded Crane 428 gate valves or approved equal.

FLAP GATES

Flap gates as shown on the drawings and described herein. Flap gates to be M&H Style 47 Flap Valves. Contractor to demonstrate operation of each flap gate.

PART 3 EXECUTION

Bolt holes of flanged valves shall straddle the vertical centerline of the pipe run. Prior to installing flanged valves, the flange faces shall be thoroughly cleaned. After cleaning, insert gasket and bolts, and tighten the nuts progressively and uniformly. If flanges leak under pressure, loosen or remove the nuts and bolts, reseat or replace the gasket, retighten and/or reinstall the nuts and bolts, and retest the joints. Joints shall be watertight at test pressures before acceptance.

Thoroughly clean threads of screwed joints by wire brushing, swabbing, or other approved methods. Apply approved joint compound to threads prior to making joints. Joints shall be watertight at test pressures before acceptance.

PLACING

Generally, unless otherwise indicated on the Drawings, all valves installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above the finish floor shall be installed with their operating stems vertical. Valves installed in horizontal runs of pipe

having centerline elevations 4 feet 6 inches or greater above the finish floor shall be installed with their operating stems horizontal. If adjacent piping prohibits this, the stems and operating handwheel shall be installed above the valve horizontal centerline as close to horizontal as possible.

TESTING

Valves shall be tested at the same time that the adjacent pipeline is tested. Joints shall show no visible leakage under test. Repair joints that show signs of leakage prior to final acceptance. If there are any special parts of control systems or operators that might be damaged by the pipeline test, they shall be properly protected. The Contractor will be held responsible for any damage caused by the testing.

If requested by the Engineer, the valve manufacturer shall furnish an affidavit stating the materials options furnished and/or that he has complied with these and other referenced specifications.

*** END OF SECTION ***

SECTION 15400 - PLUMBING

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

A. Providing and installing water system and miscellaneous plumbing as described herein and shown on plans.

1.02 SUBMITTALS

A. Submittals: Shop Drawings and Product Data.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with Uniform Building Code (UBC), Uniform Plumbing Code (UPC), and City of Moses Lake Development Standards.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Plumbing Fixtures: Include faucets, traps, stops, and other fixtures, trim and accessories required for complete and finished installation.

B. Sanitary Drains:
   1. Soil and Waste Piping Above Ground: ABS Drain Waste Vent (DWV).
   2. Soil and Waste Piping Below Ground: ABS Drain Waste Vent (DWV).

C. Unions: Provide at each pipe connection to equipment and fixtures, and where necessary to disconnect piping for repairs. Match pipe in which installed.

D. Cleanouts: Provide at all locations required to clean piping, including end of main drain, base of all vertical stacks, at crosses, and elsewhere as required by codes and ordinances. Full size of piping served, accessible for use with conventional cleaning equipment. Provide brass lugs, with graphite lubricant on threads.

E. Floor Drains: Zurn, Z-415 with Type B stainless steel strainer, complete with flashings, clamps, and traps.

2.02 PLUMBING FIXTURES (NOT USED)

PART 3 – EXECUTION

3.01 INSTALLATION

A. Bury outside water piping minimum four feet below finished grade.

B. Slope drainage lines 1/4 inch per foot or as required to meet code.

C. Provide sealant at all exposed vertical and horizontal joints between fixtures and wall to provide a smooth and watertight transition from fixture to wall.

D. Mount fixtures at standard heights above finished floor or as shown.

E. Provide accessible cleanouts as required by code.

F. Install in accordance with Manufacturer's instructions and as per local codes and ordinances

3.02 FIELD QUALITY CONTROL

A. Water Piping: Test by hydrostatic pressure at least 1-1/2 times maximum operating pressure, but not less than 100 psi, for a minimum of 24 hours. Use only potable water for testing.

B. Waste and Vent Piping: Fill with water to highest point in each system with all air removed.

*****END OF SECTION*****

CERTIFICATION PAGE

I hereby certify that these contract documents were prepared by me or under my direct supervision and that I am a duly licensed engineer under the laws of the State of Washington.

4-20-2015

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SECTION 16010
GENERAL ELECTRICAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. The General Conditions, Supplementary Conditions, and related work in other Sections apply for all work in Section 16.

1.2 SCOPE OF WORK

A. This section specifies general requirements for electrical work. Detailed requirements for specific electrical items are specified in other sections, but are subject to the general requirements of this section. The electrical drawings and schedules included in this project manual are functional in nature and do not specify exact locations of equipment or equipment terminations. It is the intent of this Section of the Specifications and the accompanying drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and fully operational condition all equipment, materials, devices and necessary appurtenances to provide a complete electrical system, together with such other miscellaneous installations and equipment hereinafter specified and/ or shown on the drawings. The work shall include all materials, appliances and apparatus not specifically mentioned herein or shown on the drawings, but which are necessary to make a complete, fully operational installation of all electrical systems shown on the drawings or described herein. Equipment and devices furnished and installed under other Sections of this specification shall be connected under this Section. The drawings and specifications are complementary and what is called for in either is binding as if called for in both.

B. This project may include installation of packaged equipment system(s) or sub-system(s) that will require coordination between the Contractor and the manufacturer to determine the detailed installation requirements. The Engineer has shown general installation information for these systems based on the best information available at the time of design. Where indicated on the drawings to '*provide a complete and operational system'* the Contractor shall provide all materials, installation, and coordination with the manufacturer so the equipment is installed and operates in a satisfactory manner. Minor changes in equipment locations, quantity of terminations or wires, junction boxes, conduit, etc shall be included in the Contract price.

C. See all other Sections of these specifications for work in other areas and disciplines related to this project.

1.3 GENERAL DESCRIPTION OF ELECTRICAL WORK

A. The Contractor shall provide all labor, material, tools, equipment and services required to complete the furnishing, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical equipment, devices and components as indicated and implied by the drawings and specifications.

B. General descriptions include:

1. Complete the procurement, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical devices, components, accessories and equipment that is not shown or specified but which is nonetheless required to make the systems shown and specified function properly.
2. Install all equipment so it shall be readily accessible for maintenance. Installations shall have electrical clearances in accordance with NEC and shall be installed in locations that will provide adequate cooling.
3. Check electrical equipment prior to installation so that defective equipment is not installed.
4. Provide field services of qualified technicians to supervise and check out the installation of the equipment, to supervise and check out interconnecting wiring, to conduct start-up of operation of the equipment, and to correct any problems that occur during start-up.
5. Provide circuit breakers, conduit, wire and installation for all items that require electrical power.

1.4 PROJECT DESCRIPTION

A. This project shall consist of all electrical and controls construction required to completely upgrade the existing City of Ferndale Pump Station No.4.

B. The Contractor shall provide all equipment, materials, installation, coordination and testing for one new sewer pump station, and complete demolition of an existing sewer pump station.

C. The following is a general description of the work anticipated by the Electrical Contractor:

1. Electrical demolition of existing equipment.
2. Coordination with Puget Sound Energy for electrical service modifications.
3. Provide new power distribution equipment, automatic transfer switch, and standby diesel generator.
4. Provide new electrical enclosure with electrical load center for general power distribution and lighting loads, Full Voltage pump starters, and waste water pump controls and instrumentation, as shown on the drawings.
5. Relocate existing Telemetry Panel to new equipment area and wire for pump station monitoring and control. Add expansion digital input module.
6. Startup, testing, documentation, commissioning and training for new systems.

1.5 ELECTRICAL CONTRACTOR MINIMUM QUALIFICATIONS

A. The Electrical Contractor shall have a minimum 5 years of experience with having performed similar construction installation. Provide a summary of qualifications with the bid form, including Owner, project description, and

summary of electrical equipment manufacturer and ratings.

1.6 CODES AND REGULATIONS

A. The electrical systems shall be installed based on the following current Standards:

1. NFPA 70 - National Electrical Code - current version as adopted by Washington State Department of L&I.
2. Washington Administrative Code (WAC) chapter 296-46B.
3. Building Codes - International Conference of Building Officials as adopted and amended by the Local Jurisdiction.

B. The Contractor is required to familiarize himself with the detailed requirements of these standards and any local codes and ordinances as they affect the installation of specific electrical systems.

C. Identification of Listed Products

1. All materials and equipment specified herein shall be within the scope of Nationally Recognized Testing Laboratory (NRTL) examination services, be approved by the NRTL for the purpose for which they are used, and shall bear the appropriate listing label.
2. Equipment listed/labeled by an NRTL shall be as dictated by the latest printing of the Electrical Testing Laboratories Accreditation Report available from the State of Washington Department of Labor and Industries, Electrical Inspection Division. Any NRTL listing/labeling shall be as accepted by the local authority having jurisdiction.
3. When a product is not available with a testing laboratory listing for the purpose for which it is to serve, the product may be required by the inspection authority to undergo a special inspection at the manufacturer's place of assembly. All costs and expenses incurred for such inspections shall be included in the original contract price.
4. Where field modifications require field inspection for listing/labeling, the Contractor shall be responsible for all field inspection fees for listing/labeling of all final modified electrical assemblies.

D. Thermal ratings of equipment terminations

1. All materials shall conform to the National Electrical Code Article 110-14C. Wiring and circuit breakers on this project are designed for 75 deg C operation above 100 amperes; 60 deg C for 100 amperes and below. All products furnished on this project shall have electrical terminations rated for 60 deg C for ampacities of 100 amperes and below, and rated for 75 deg C for ampacities above 100 amperes.

1.7 PERMITS AND FEES

A. The Contractor shall obtain and pay for all licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. The

Contractor shall arrange for inspection of work by the inspectors and shall give the inspectors all necessary assistance in their work of inspection.

1.8 COORDINATION

A. The Contractor responsible for accomplishing Section 16 work shall coordinate his work with that of the other Contractors and/ or other trades doing work on the project and shall examine all drawings and specifications of other trades for construction details and necessary coordination.

B. Obtain submittals and shop drawings of all equipment with electrical connections furnished under other Sections of the specifications. Provide all wiring in accordance with requirements indicated. Advise the Engineer of any changes which may affect the contract price.

C. Special attention is called to the following items and all conflicts shall be coordinated prior to installation:

1. Location of pipes and equipment so that all electrical equipment, lighting fixtures and other electrical outlets and equipment are clear from and in proper relation to these items.
2. Recessing and concealing electrical materials in CMU walls, concrete construction and similar construction methods.
3. Electrical characteristics (HP, KVA, voltage, phase) of actual equipment furnished under other Sections being different from that shown on the electrical drawings.

D. The Contractor will not be paid for relocation of work, cuttings, patching and finishing required for work requiring reinstallation due to lack of coordination prior to installation.

1.9 SITE FAMILIARIZATION

A. The Contractor shall become familiar with all features of the site which may affect the execution of the work prior to submitting a bid. The Contractor shall take all field measurements necessary for the work and shall assume full responsibility for their accuracy. The Contractor shall take full responsibility for locating and avoiding all substructures and utilities. Any damage to existing equipment or utilities shall be repaired or replaced by the Contractor at the Contractors expense.

1.10 AREA CLASSIFICATIONS

A. The following classification of areas shall be used as a reference in determining application of material covered by this Section unless specifically shown otherwise on the drawings.

1. Outdoor, Damp or Corrosive Areas:

a. Raceways shall be Rigid Galvanized Steel (RGS). Conduit entrances shall be threaded and fittings shall have gasketed covers. Threaded fastening hardware and rods shall be

galvanized or stainless steel. Raceway supports such as channel, clamps, and brackets shall be galvanized steel, stainless steel or aluminum. Panels and boxes shall be NEMA 4X, 3R or as shown on the drawings. Enclosures shall be mounted 1 inch from walls to provide an air space unless specifically shown otherwise. Device boxes shall be cast, copper free aluminum.

2. Below Grade Areas:

   a. Conduits shall be Schedule 40 PVC, or as indicated on the drawings. Sweeps shall be RGS. Transitions from below to above-grade areas in damp areas shall be PVC coated RGS.

3. Hazardous areas: All areas indicated as Hazardous Areas on drawings, or as classified by NFPA 820.

   a. Raceways, junction boxes and sealing fittings shall be installed in accordance with NFPA 70, article 500.

4. General Purpose Areas: All other areas not described above

   a. Raceways shall be RGS. Raceways concealed in walls or ceilings for general purpose lighting and receptacle circuits may be EMT. Exposed boxes shall be NEMA 12. Concealed boxes may be NEMA 1.

1.11 CONTRACT DRAWINGS

A. Raceways, boxes, and ground connections are shown diagrammatically only and indicate the general character and approximate location. The drawings do not necessarily show the total number of raceways or boxes for the circuits required, nor are the locations of indicated runs intended to show the actual routing of the raceways. The Contractor shall furnish, install and place in satisfactory condition all raceways, boxes, conductors, and connections and all other materials required for the electrical systems shown or noted in the contract documents to be complete, fully operational and fully tested upon completion of the project.

B. The drawings do not show all requirements of the specifications. The drawings and specifications are complimentary and what is called for (or shown) in either is required to be provided as if called for in both.

C. The horsepower of motors and apparatus wattages shown on the drawings are estimated requirements of equipment furnished under other Sections of this contract and bid shall be based on these sizes. Overload elements shall be provided to suit actual equipment nameplate current. Advise Engineer of any equipment changes or substitutions affecting electrical systems.

D. Any minor changes in the location of the raceways, outlets, boxes, devices, wiring, Utility equipment, etc., from those shown on the drawings shall be made without extra charge, where directed before rough-in.

E. When inserts or sleeves for outlet boxes, conductor, cables and/ or raceways are required, Contractor shall provide and shall fully coordinate the installation with other trades.

F. Electrical drawings shall be used for construction of electrical systems only. The electrical drawings do not show construction features of other trades.

1.12 ELECTRICAL SUBMITTALS

A. Electrical submittals shall be submitted, bound in a three-ring binder, labeled with the project and Contractor's name. An index sheet shall be provided showing each product being submitted. Submittals shall be provided with section tabs per the electrical specifications by section and paragraph or equipment. Each equipment submittal sheet shall clearly indicate the individual equipment name and part number. Submittals shall include:

1. Manufacturer’s name, address, and telephone number
2. Trade name, catalog model or number, nameplate data and size clearly indicated
3. Layout dimensions, capacity, project specification and paragraph reference
4. Local manufacturers representative

B. Submittals shall be largely complete prior to the first submittal. Long lead items may be submitted separately. Each item shall be clearly marked and provided with adequate sales and technical information to clearly show conformance with all aspects of the specification. Packages not provided as described above or largely incomplete shall be returned to the Contractor, without review or comment.

C. The Contractor shall ensure that the material being proposed conforms to the Contract requirements. In the event of any variance, the Contractor shall state specifically which portions vary and shall request a variance in writing. The Contractor shall certify that all furnished equipment can be installed in the spaces allocated.

D. The Contractor shall provide shop drawings on 11” x 17” paper, and shall be scaled using standard engineering or architectural scales. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment.

E. Failure to submit a specified item does not relieve the Contractor from meeting the requirements of the Specification.

F. The Engineer will review the original submittal and one re-submittal on each item. Subsequent submittal reviews shall be conducted at the Contractor's expense. The Contractor shall be billed at the Engineer's current hourly rates for these subsequent submittal reviews.

1.13 EXISTING SYSTEMS

A. Prior to bidding, the existing site, exiting site electrical systems and systems adjacent to the work shall be investigated thoroughly. Any damage resulting from performance of work under this contract shall be repaired to assure continuing operation and integrity during and at completion of the project a no

increase in contract cost. Any existing wiring serving devices to remain in service and which is interrupted by work performed under this contract shall be rerouted to maintain circuit continuity. Contractor shall assume responsibility for unscheduled interruptions and expedient repair. The Contractor shall inspect the existing systems prior to bidding and shall make his own judgment as to the work required to provide a complete installation within the intent of the contract documents.

1.14 DEMOLITION WORK

A. All demolition work required under this contract is not shown on the drawings.

B. The Contractor shall inspect the existing sites and installations prior to bidding and shall make his own judgment as to the work required to provide complete demolition as shown or within the intent of the contract documents.

C. Existing equipment, systems, and materials removed during demolition shall be made available for his inspection and decision as to whether the Owner will retain possession. Items selected for retention shall be turned over to the Owner. These items shall be delivered to a location on the premises selected by the Owner.

D. All material not selected for retention by the Owner and debris shall be legally disposed of by the Contractor.

1.15 RECORD DRAWINGS

A. The Contractor shall record the actual electrical system installation on a set of prints kept readily available at the project during construction. These prints shall be used for this purpose alone. Accurately locate with exact dimensions all underground and under slab raceways and stub-outs. At the completion of the work, Contractor shall furnish the Engineer a set of record drawings and the set of markups. Final payment to the Contractor will not be authorized until these prints have been submitted to and accepted by the Engineer. The contractor shall maintain one set of record drawings at the job showing any deviations in the electrical systems from the original design.

B. Markings shown on the drawings shall conform to the following color coding conventions:

1. Red - Additions or changes showing placement different than shown on the original drawings

2. Green - Deletions or modifications depicting placements different than shown on the original drawing

3. Blue - Notes and Dimensional data showing exact placement of concealed or buried equipment, raceways, etc.

1.16 WARRANTY

A. The Contractor shall guarantee all work installed under this specification. He shall repair or replace, at his own expense, defective work, materials or parts

which are identified within one year after final acceptance.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials must be new, free from defects and not less than the quality herein specified.

B. Each type of materials furnished shall be of the same make and shall be of the standard products or manufacturers regularly engaged in the production of such materials and shall be the manufacturer's latest standard design.

C. All materials and equipment installed shall have been tested and listed by Underwriters Laboratories or other approved testing organization and shall be so labeled unless otherwise permitted by the Code Inspector (AHJ).

2.2 NAMEPLATES

A. Nameplates shall be provided on all electrical devices. This includes motor control equipment, MCC buckets, control stations, junction boxes, panels, motors, instruments, switches, indicating lights, meters, and all electrical equipment enclosures.

B. Nameplates shall be made of 1/16" thick machine engraved laminated phenolic having engraved black filled letters not less than 3/16" high on white background.

C. Warning nameplates shall be provided on all panels and equipment which contain multiple power sources or which may have energized circuits with the main disconnecting means in the off position. Lettering shall be white on red background.

D. All nameplates shall be secured to equipment with stainless steel screws or fasteners. Epoxy glue may be used where fasteners are not practical as determined by the Engineer.

2.3 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The Contractor shall prepare O&M manuals for all equipment furnished under Section 16 of the specifications.

B. The information included must be the exact equipment installed. Where sheets show the equipment installed and other equipment, the installed equipment shall be neatly and clearly identified on such sheets.

C. The O&M manuals shall contain all the information needed to operate and maintain all systems and equipment provided in the project. It shall be presented and arranged in the logical manner for efficient use by the Owner's operation personnel. The information provided shall include but not be limited to the following:

1. Equipment manufacturer, make, model number, size, etc.

2. Equipment nameplate data.

3. Description of system configuration and operation including component identification.

4. Dimensional and performance data for specific unit provided.

5. Manufacturer's recommended operation instructions.

6. Manufacturer's recommended lubrication and servicing data.

7. Complete parts list including reordering information and recommended spares. Parts lists shall give full ordering information assigned by the original parts manufacturer.

8. Shop drawings and wiring diagrams.

9. Provide electronic .pdf copies of all O&M documentation and panel drawings.

D. Wiring diagrams for each system shall be complete drawings for the specific system installed under the contract.

E. The information contained in the manuals shall be grouped in an orderly arrangement by specification index. The manuals shall be bound in a hard cover binder and tabbed with an index. O&M manuals shall not exceed 5" thick. Provide two or more volumes if required. The covers shall be imprinted with the name of the job, Owner, Engineer, Electrical Engineer, Contractor and year of completion. Hard covers and literature contained may be held together with screw post bindings.

F. A preliminary copy, complete, except for the bound cover, shall be submitted 30 days prior to completion of the project for checking and review. The quantity of manuals shall be as indicated in the General Conditions, but shall not be less than (3) complete sets.

2.4 HOUSEKEEPING PADS

A. Provide a concrete housekeeping pad under each floor mounted motor control center and other floor mounted electrical equipment. Pad shall be 3" wider on both ends than base of equipment mounted on it. Minimum height is 3".

PART 3 - EXECUTION

3.1 STORAGE AND HOUSEKEEPING

A. The Contractor shall store all electrical equipment in a dry environment free from dust, moisture, sprays or vapors which may be detrimental to their new condition. After installation of equipment, the Contractor shall take care to protect all equipment from all dust, moisture, paint and other sprays, and harmful vapors.

B. The premises shall be kept free of accumulated materials, rubbish and debris at all times. Surplus material, tools and equipment must not be stored at the job site. Upon completion of the project, all equipment and fixtures shall be cleaned and in proper condition for their intended use.

3.2 SCHEDULING WORK WITH UTILITIES

A. The Contractor shall be fully and completely responsible for all scheduling and coordination with the Utility companies, including the electrical utility provider, and telephone company, as applicable. The Contractor shall coordinate and schedule power outages, power service for operation and construction, telephone and power service as required by the facility prior to Certificate of Occupancy. All coordination with the Utility and associated construction costs for temporary construction power shall be paid for by the Contractor. The Contractor shall pay the for the energy costs as billed by the utility on the construction power meter.

3.3 CONTRACTOR/UTILITY INTERFACE RESPONSIBILITIES

A. Contractor shall clarify all questions regarding utility installation prior to bid. The Contractor shall comply with all Utility company standards and requirements. The serving Utility for this project is Puget Sound Energy.

B. The separation of responsibility for installation tasks shall be coordinated with the Utility at the time of construction.

C. Utility fees from Puget Sound Energy for the electrical service modifications will be paid by the City.

D. The Contractor shall provide the following service and material, as indicated on the drawings:

1. Provide new complete secondary underground service from the existing pole to new service panel location.
2. Install warning tape for electrical utilities, provided by Utility.
3. Provide new meter base at pole.
4. Coordinate local agency inspections.
5. Provide all secondary conduit, conductors, and raceway.
6. Provide fiber conduit and stub and cap near service equipment for future use.

E. The Utility will provide the following service and material:

1. Pole mount utility transformer upgrade.
2. Secondary conductors from pole mount transformer to meter base.
3. Install electric meter in Contractor-furnished meter base.

F. Service equipment shall be listed and labeled by UL as "Suitable for Use as Service Equipment".

3.4 TESTS

A. The Contractor shall conduct testing for installed feeder cables, motors, and other electrical equipment.

B. Functional testing of all electrical systems shall be performed. Prior to functional testing, all protective devices shall be adjusted and made operative. Prior to energizing the equipment, the Contractor shall perform a functional checkout of each individual control circuit. Checkout shall consist of energizing each control circuit and operating each control device and verifying that the specified action occurs. The Contractor shall submit a description of the proposed functional test procedures prior to the performance of the functional checkout.

3.5 TRAINING

A. After substantial completion of the work, O&M manuals have been delivered to the owner, all testing is complete and final inspection of the work by the Authority(s) Having Jurisdiction, the Contractor shall demonstrate the electrical systems and instruct the Owner's designated operation and maintenance personnel in the operations and maintenance of the various electrical systems. The Contractor shall arrange scheduled instruction periods with the Owner. The Contractor's representatives shall be knowledgeable in each system and suppliers representatives, when so specified.

B. Scheduled minimum instruction period at each location shall be:

1. Electrical Systems 2 Hours
2. Pump Control Systems 4 Hours

3.6 FINAL ACCEPTANCE

A. Prior to final acceptance, the Engineer will perform one or more site observation trips to develop a punch list of items deemed incomplete. The Electrical Contractor shall be present while these inspections are taking place and shall be available for opening cabinets and operating and adjusting the system as is necessary for the Engineer to verify all equipment is installed and operates to the requirements of the contract documents.

B. The Contractor shall complete all items of work, including wire markers, nameplates, final tests and final test reports prior to requesting final acceptance inspections. All equipment shall be checked for proper operation and all signals verified for correct calibration and wiring. Fixtures shall have been cleaned, and burned out or defective lamps shall have been replaced.

3.7 STANDARD ABBREVIATIONS

Abbreviation	**Definition**
Accepted	Reviewed with no exceptions taken to submittal material.
AHJ	Authority Having Jurisdiction
ANSI	American National Standards Institute
Approved	Inspected and accepted by the Authority Having Jurisdiction
ASTM	American Society for Testing Materials
Boxes	Outlet, Junction or Pull Boxes
Code	All codes currently enforced at project location
Compression	Compressed using a leverage powered crimping tool
Connection	All materials and labor required for equipment to be fully

	operational
CSI	Construction Specifications Institute
EMT	Electrical Metallic Tubing
Exterior	Outside of outer surfaces of the location building
Fully Operational	Tested and approved and operating to the satisfaction of the AHJ, manufacturer and contract documents
Furnish	Purchase and deliver material
Install	Install and make fully operational
kcmil	Thousand circular mils (also MCM)
Mfr	Manufacturer
NEC	National Electric Code NFPA #70 current revision as adopted by AHJ
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
Noted	Shown or specified in the contract documents
PVC	Polyvinyl Chloride
Provide	Furnish and install
RGS, GRS	Rigid Galvanized Steel
Required	As required by code, AHJ, or contract documents for the installation to be fully operational
Shop Drawing	Hand drafted document which fully details the equipment and intended installation relative to this specified project
Shown	As indicated on the drawings or details
Submittal	Material for Engineer review which may include catalog cuts, shop drawings, wiring diagrams, etc., of the actual material being furnished.
UL	Underwriters Laboratories, Inc.
Wiring	Raceway, conductors and connections

END OF SECTION 16010

SECTION 16110
RACEWAYS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies raceways for electrical conductors including fittings and supports. Raceways shall be provided for power, control, instrumentation, grounding, lighting, receptacles, and signaling systems. Raceways consist of conduits, tubing, and tray systems. For the purpose of this specification, conduit and tubing is described collectively as conduit.

PART 2 - PRODUCTS

2.1 GENERAL

A. Material

1. All materials shall be new, free from defects, of current manufacture, of quality specified or shown. Each type of material shall be of the same manufacturer throughout the work.

B. Unscheduled Raceway

1. With the exception of lighting, communication, paging, security and receptacle circuits, the type and size of raceway shall be as specified on the drawings or schedules. Lighting and receptacle raceway are unscheduled and shall be sized by the contractor in accordance with the NEC. Minimum size shall be 1/2 inch for exposed and 1 inch for embedded raceway.

C. Scheduled Raceway

1. The size and type of raceway shall be as specified on the drawings or schedules. In case of conflicts between the drawings and paragraph 3.1, the drawings shall prevail.

2.2 RACEWAY

A. Application – also see Area Classifications Section 16010.1.10.

1. All conduits shall be Galvanized Rigid Steel (GRS), unless otherwise noted.
2. All connections to vibrating equipment or motors shall be liquidtight flexible metallic conduit.
3. PVC installed above grade shall be UV resistant Schedule 80.
4. Underground power, control and telephone conduits shall be schedule 40 PVC. (All sweeps and risers for transition from below grade to above

grade shall be PVC coated, GRS), unless indicated otherwise.

5. Underground conduits serving non-critical loads such as site lighting, signs, etc. shall be PVC schedule 40.

6. Indoor lighting and receptacle circuits may be EMT. Conduit shall be concealed where possible.

B. Rigid Steel Conduit (RGS)

1. Rigid conduit shall be steel, hot dipped galvanized. Final conduit terminations shall be by means of threaded hubs or double locknuts and insulating grounding type bushings.

C. Liquid Tight Flexible Metallic Conduit

1. Flexible conduit shall be interlocking single strip, hot dipped galvanized and shall have a polyvinyl chloride jacket extruded over the outside to form a flexible watertight raceway.

D. Nonmetallic Conduit

1. Nonmetallic conduit shall be rigid PVC, Schedule 40 or 80. Fittings shall be of the same material as the raceway and installed with solvent cement per the manufacturer's instructions. Conduit, fittings and solvent cement shall all be manufactured by the same manufacturer.

E. PVC Coated Rigid Steel Conduit

1. Conduit shall be hot dip galvanized, then coated with urethane inside and outside, then covered with 40 mil PVC coating.

F. Aluminum Conduit

1. Aluminum conduit shall be rigid ANSI C80.5, threaded.

G. Electrical Metallic Tubing (EMT)

1. EMT shall be UL 797 and ANSI C80.3, steel tubing, hot-dip galvanized. EMT fittings shall be ANSI/NEMA FB 1, steel, raintight, insulated throat, compression type.

2.3 FITTINGS AND BOXES

A. Material

1. Materials for fittings and boxes shall be chosen to satisfy the requirements of Paragraph 16010. 1.10 - Area Classification. All screws, nuts, bolts, and other hardware used with fittings and boxes shall be stainless steel unless installed in general purpose areas.

B. Unions

1. All unions of the type designated as UNF and UNY and shall be suitable

for use in moist atmospheres. Unions shall be of cast ferrous alloy, electroplated with zinc.

C. Locknuts

1. All locknuts used in general purpose areas shall be extra heavy steel electroplated with zinc for sizes ¾ inch to 2 inches. Locknuts larger than 2 inches shall be of malleable iron, electroplated with zinc. Locknuts used in damp and outdoor areas shall be stainless steel. Locknuts in corrosive areas shall be FRP.

D. Bushings

1. All bushings shall be steel or malleable iron threaded type electroplated with zinc or hot-dip galvanized. Bushings shall have a molded-phenolic or nylon insulating collar.

   a. Grounding Bushings: Grounding-type bushings shall have a projecting portion drilled for the size grounding cable used and shall be provided with a clamp or set screw for securing the cable. In addition, a set screw shall be provided to securely lock the bushing to the conduit. Grounding bushings shall be GEDNEY Type IBC-L-BC, or T&B No. 3870 through 3880, or T&B BG Series, or equal.

   b. Bushed Openings: Bushings for protection of cables passing through metal boxes or troughs shall all be phenolic type and shall be OZ Type ABB, or equal.

   c. Hubs for connection of conduit to boxes shall be of zinc. Hubs for use in damp or corrosive areas shall be non metallic or aluminum to match the raceway. The hubs shall provide a liquidtight connection to the box and an insulating bushing for the wiring. Hubs shall be Thomas and Betts bullet type, or equal.

E. Liquidtight Flexible Metallic Conduit Connectors:

1. Connectors for liquidtight flexible metallic conduit shall be electroplated zinc malleable iron. An O-ring gasket and an approved grounding insert shall be part of the unit. Where applicable, 45 degree and 90 degree fittings may be used. Liquid-tight connectors shall be by O.Z. GEDNEY, or equal.

F. Expansion Fittings

1. Expansion fittings in exposed runs shall be weatherproof type and shall be provided with an external bonding jumper. The expansion fittings shall allow for 4 inch longitudinal movement and shall be designed so that when completely assembled the end of each conduit entering the fitting is bushed. Fittings shall be O.Z. GEDNEY Type EX, or equal.

2. Deflection fittings in embedded runs shall be of the watertight type and shall be provided with an internal bonding jumper. The expansion material shall be neoprene and shall allow for ¾ inch movement in any

direction. Fittings shall be O.Z. GEDNEY Type DX, or equal.

G. Junction Boxes

1. Junction boxes, device boxes, fixture support boxes, oblong, round and rectangular conduit fittings (condulets) shall be of the same material as required by the area classification for the raceway. Junction boxes for use in general purpose areas shall be zinc electroplated cast ferrous alloy. Integrally cast threaded hubs or bosses shall be provided for all conduit entrances and shall provide for full 5 thread contact on tightening. Drilling and threading shall be complete before finishing. Boxes shall be Crouse-Hinds type FS, FD, or approved equal.

2. Cover plates shall be of similar cast ferrous alloy material and finish. Full body neoprene gaskets shall be provided with all covers and shall fastened with stainless steel screws.

3. NEMA 12 boxes shall be of heavy gauge sheet steel, or cast metal. All NEMA 12 boxes shall be provided with a 5 mil thick light gray thermo-epoxy finish, and designed so that moisture will drain away from the gasketed cover joint. Covers for sheet steel boxes shall have turned edges, ground smooth to form a tight seal against the gasket when the cover is closed.

2.4 CONDUIT & CABLE SUPPORTS

A. Conduit Supports

1. Hot-dip galvanized framing channel shall be used to support groups of conduit. Individual conduit supports shall be one-hole galvanized malleable iron pipe straps used with galvanized clamp backs and nesting backs where required. Conduit supports for PVC or epoxy coated rigid steel and PVC conduit systems shall be one hole PVC or epoxy coated clamps or PVC conduit wall hangers.

B. Ceiling Hangers

1. Ceiling hangers shall be adjustable galvanized carbon steel rod hangers as specified. Straps or hangers of plumber’s perforated tape are not acceptable. Unless otherwise specified, hanger rods shall be 1/2-inch all-thread rod and shall meet ASTM A193. Hanger rods in corrosive areas and those exposed to weather or moisture shall be stainless steel.

C. Racks

1. Racks shall be constructed from framing channel. Interior channels and hanger rods shall be steel, hot dip galvanized, 1.5 oz. / sq. ft. after fabrication. Field cuts shall be re-galvanized by the Galv-A-Weld process or equal. Channels attached directly to building surfaces shall be 14 gauge minimum thickness, 1-5/8 inch deep.

2. Framing channels on all exterior areas and in corrosive areas shall be stainless steel. All hardware shall be stainless steel. Framing channel shall be as manufactured by Unistrut or equal.

2.5 CONDUIT SCHEDULE

A. Refer to conduit schedule on the drawings for raceway sizing and routing description.

2.6 CONDUIT TAGS

A. Conduit tags shall be corrosion resistant and remain legible after exposure to abrasion or aggressive fluids. Tags shall be crosslinked polyolifin construction. Manufacturer shall be Impact Industries, or equal.

2.7 HAND HOLES

A. Hand holes shall be precast concrete with checker plate, galvanized, traffic covers designed for H-20 loading. Dimensions shall be as specified on the drawings. Hand holes shall be provided with precast solid concrete slab bottoms with sumps, with drains, or as shown on the drawings. Hand holes shall be construction of 3000 psi reinforced concrete.

2.8 UNDERGROUND MARKING TAPE (DETECTABLE TYPE)

A. Underground marking tape shall be for location and early warning protection of buried power and communication lines. Tape shall be detectable by a pipe / cable locator or metal detector from above the undisturbed ground. Tape shall be nominally 2 inches wide with a type B721 aluminum foil core laminated between two layers of 5 mil thickness polyester plastic. The plastic color shall be red for electrical lines and orange for telephone lines. A warning shall be imprinted continuously along the length, with message reading similar to: “CAUTION - STOP DIGGING - BURIED ELECTRIC (TELEPHONE) LINE BELOW.” Tape shall be Brady “Detectable Identoline”; Services and Materials “Buried Underground Tape, Detectable”, or equal.

PART 3 - EXECUTION

3.1 CONDUIT

A. General

1. The Contractor shall limit the number of directional changes of the conduit to a total not more than 270 degrees in any run between pull boxes. Conduit runs shall be limited to 400 feet, less 100 feet or fraction thereof, for every 90 degrees of change in direction. Bends and offsets shall be avoided where possible but, where necessary, shall be made without flattening or kinking, or shall be factory preformed bends. Turns shall be made with case metal fittings or conduit bends. Welding, brazing or otherwise heating of conduit is not acceptable.

2. Where required for pulling cable and as necessary to meet the requirements of the previous Paragraph, the Contractor shall provide cast junction or pull boxes.

3. Conduit entering NEMA 1 type sheet steel boxes or cabinets shall be secured by locknuts on both the interior and exterior of the box or cabinet

and shall have an insulating grounding or bonding bushing constructed over the conduit end. Conduit entering all other boxes shall be terminated with a threaded hub. Cast boxes and nonmetallic enclosures shall have threaded hubs. Joints shall be made with standard couplings or threaded unions. Metal parts of nonmetallic boxes and plastic coated boxes shall be bonded to the conduit system. Running threads shall not be used in lieu of conduit nipples, nor shall excessive thread be used on any conduit. The ends of conduit shall be cut square, reamed and threaded with straight threads.

4. Unless otherwise specified, conduit entering field equipment enclosures shall enter the bottom or side of the box. Where conduit comes from above, it shall be run down beside the enclosure and a tee condulet and drip leg shall be installed.

5. When new conduit is added to areas which are already painted, the conduit and its supports shall be painted to match the existing facilities. Where new conduit is used to replace existing conduit, the existing conduit and supports shall be removed, resulting blemishes shall be patched and repainted to match original conditions.

B. Conduit Support

1. Exposed conduit shall be run on supports spaced not more than 10 feet apart and shall be constructed with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceiling.

2. Where three or more conduits are located in a parallel run, they shall be spaced from the wall using framing channel. Support systems shall be galvanized steel unless otherwise specified.

3. Conduit rack and tray supports shall be secured to concrete walls and ceilings by means of cast-in-place anchors. Individual conduit supports shall use cast-in-place anchors, die-cast, rust-proof alloy or expansion shields. Wooden plugs or plastic inserts are not acceptable as a base to secure conduit supports.

C. Conduit Penetrations

1. Unless otherwise specified, conduit routed perpendicular through floors, walls or other concrete structures shall pass through cast-in-place openings wherever possible. In cases where cast-in-place openings are not possible, appropriate size holes shall be bored through the concrete to accommodate the conduit passage. The size and location of the holes shall not impair the structure’s integrity. After completion, grout or caulk around conduit and finish to match existing surroundings. Unless otherwise protected, conduits that rise vertically through the floor shall be protected by a 3 1/2-inch high concrete pad with a sloping top.

2. Conduits entering manholes and handholes shall be horizontal. Conduits shall not enter through the concrete bottom of handholes and manholes.

3. Wherever conduits penetrate outdoor concrete walls or ceilings below grade, the Contractor shall provide a watertight seal as manufactured by O.Z. Gedney Co., Type CSM Series; Thunderline Corp., Link Seal; or

equal.

4. Wherever conduits enter buildings or structures below grade, seal the conduit opening (after installation of conductors and cables), with conduit sealing material, to prevent water from entering the structure, enclosure, etc. Sealing compound to be a pliable, removable putty-type compound listed for the application.

D. Conduit Separation

1. Signal conduits shall be separated from AC power or control conduits. The separation shall be a minimum of 12 inches.

E. Conduit Seals for Hazardous or Corrosive Areas

1. Each conduit passing from a hazardous or corrosive area into a non-hazardous or non-corrosive area shall be provided with a sealing fitting which may be located on either side of the boundary. The seal shall be located at the boundary in accordance with NEC article 500.

2. Seal fittings for conduit systems in hazardous atmosphere locations shall be hot-dip galvanized case ferrous alloy. Sealing compound shall be hard type, Chico A, or equal, UL listed for explosion-proof sealing fittings. Sealing compound shall be non-hardening type for corrosive areas. Provide reducing bushings and larger seals as required to meet NEC 25% fill.

3.2 HAND HOLES

A. Hand holes shall be set plumb and the tops shall be at finished grade level, or as shown on the drawings. Drainage systems shall be installed to prevent the buildup of standing water inside the hand hole.

END OF SECTION 16110

SECTION 16120
WIRE AND CABLE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies conductors and cables rated to 600 volts used for power, lighting, receptacle, signal, and control circuits.

PART 2 - PRODUCTS

2.1 GENERAL

A. With the exception of lighting, communication, paging, security and receptacle circuits, the type, size and number of conductors shall be as specified on the drawings or schedules. Lighting and receptacle circuit conductors are unscheduled and shall be sized by the Contractor in accordance with the NEC to limit voltage drop to 3 percent. Number and types of communication, paging, and security cables shall be a required for the particular equipment provided.

2.2 LIGHTING AND RECEPTACLE BRANCH CIRCUIT CONDUCTORS

A. Lighting and receptacle conductors shall be stranded except for 12 AWG which shall be solid. Minimum conductor size shall be 12 AWG.

B. Conductors shall be provided with the following characteristics:

1. Voltage: 600 volts
2. Conductor: Bare soft annealed copper, Class B stranded per ASTM-8; solid per ASTM B-3
3. Insulation: THWN/THHN, 90 degree C dry, 75 degree C wet polyvinylchloride (PVC)
4. Jacket: Nylon
5. Flame resistance: UL 83
6. Manufacturer: Okonite; Southwire; or equal
7.

2.3 POWER AND CONTROL CONDUCTORS AND CABLE, 600 VOLT

A. Single Conductor:

1. Single conductor cable shall be stranded and shall be used in conduits for power and control circuits.
2. Conductor shall be provided with the following characteristics:

a. Voltage 600 volts

b. Conductor: Uncoated, soft annealed copper, Class B stranded per ASTM B-8

c. Insulation: Power #6 AWG and larger: XHHW-2, 90 degrees C cont. rating, wet or dry.

d. Power up to #6 AWG: THHN/THWN, 90 degrees C cont. rating, wet or dry

e. Control: THHN/THWN, 90 degrees C cont. rating, wet or dry

f. Flame resistance: UL 83

g. Manufacturer: Okonite, Southwire; Anaconda; or equal

2.4 CONNECTORS

A. Pre-insulated Connectors for splices and taps in conductors 10 AWG and smaller shall be Ideal Industries "Wing Nut" or 3M Company "SCOTCHLOCK", or equal. For 8 AWG and larger conductors shall be T&B compression connectors, or equal. Compress using manufacturers recommended die and tools.

B. Waterproof silicone filled “wing nut” type connectors or spade/lug type terminations and terminals and coat with liquid insulation shall be used for all connections of wire to cord to removable equipment provided with integral cords (such as floats, transmitters, limit switches, etc.) in junction boxes in underground hand holes or outdoor junction boxes. Insulators shall be Thomas and Betts multi splice insulator MSLT112-4, or equal.

2.5 SPLICE INSULATION

A. Splice insulation shall be equal or greater than the insulation level of the conductor used.

B. All permanent splices that are underground or in damp or corrosive environments shall be insulated with cast epoxy type insulation which covers the jacket of all cords and the insulation on all wire. Epoxy splice shall be Scotch #3570 or equal.

2.6 WIRING SCHEDULE

A. Refer to cable schedule for description of conductors required.

2.7 MOTOR TERMINAL SPLICE INSULATION

A. Motor terminal splice insulation in the motor connection box shall be provided which will withstand constant vibration and abrasion without degrading the insulation of the splice. A product shall be used that is specifically designed for the purpose of motor terminations in accordance with the following:

1. Motor splices in general purpose areas: bolted splice with a TY-RAP boot type insulator, Thomas and Betts Splice insulator Series MSC, or equal. Splices using wire larger than 8 AWG may be heat shrinkable motor connection stub splices, Raychem, MCK-V series, or equal.

2. Motors in outdoor, damp, or corrosive environments: waterproof motor stub insulator, Thomas and Betts multi splice insulator MSLT112-4, or equal. Splices using wire larger than 8 AWG may be heat shrinkable motor connection stub splices, Raychem, MCK-V series, or equal.

2.8 WIRE MARKERS

A. Field installed wire markers shall be T&B SMS pre-printed clip-on markers, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Each power and control conductor shall be identified at each terminal to which it is connected.

B. Pulling wire and cable into conduit or trays shall be completed without damaging or putting undue stress on the cable insulation. Soapstone, talc or UL listed pulling compounds are acceptable lubricants for pulling wire and cable. Grease is not acceptable. Raceway construction shall be complete, cleaned, and protected from the weather before cable is placed in the raceway.

3.2 600 VOLT CONDUCTOR AND CABLE

A. Conductors in panels and electrical equipment, 6 AWG and smaller, shall be bundled and laced at intervals not greater than 6 inches, spread into trees and connected to their respective terminals. Lacing shall be made up with plastic cable ties. Lacing is not necessary in plastic panel wiring duct. Conductors crossing hinges shall be bundled into groups not exceeding 12 and shall be so arranged that they will be protected from chafing when the hinged member is moved.

B. Slack shall be provided in junction and pull boxes and hand holes. Slack shall be sufficient to allow cables or conductors to be routed along the walls of the box. Amount of slack shall be equal to largest dimension of the box. Where plastic panel wiring duct is provided for wire runs, lacing is not required.

C. Solid wire shall not be lugged, nor shall electrical spring connectors be used on any except for solid wires in lighting and receptacle circuits. Lugs and connectors shall be installed with a compression tool.

D. All splices and terminations are subject to inspection by the Engineer prior to and after insulating. Terminations at 460-volt motors shall be made by bolt-connecting the lugged connectors. Connections shall be insulated and sealed with factory-engineered kits. Bolt connection area shall be kept free of mastics and fillers to facilitate rapid stripping and re-entry. Motor connection kits shall accommodate a range of cable sizes for both in-line and stub-type configurations. Connection kits shall be independent of cable manufacturer's tolerances.

E. In-line splices and tees, where approved, shall be made with tubular

compression connectors and insulated as specified for motor terminations, except that conductors 10 AWG and smaller may be spliced using self-insulating connectors. Splices and tees in underground handholes or pull boxes shall be insulated using Scotch-cast epoxy resin splicing kits. Terminations at devices with 120 volt pigtail leads shall be made using self-insulating tubular compression connectors.

F. Terminations at solenoid valves, 120 volt motors, and other devices furnished with pigtail leads shall be made using self insulating tubular compression connectors.

G. In the case where multiple field located instrumentation and control devices require parallel or series wiring configuration, it shall be done at one location in one junction box with terminals. Interconnection of instrumentation and control devices shall not be done within conduit bodies (i.e. LBs, condulets, etc.)

H. Provide shielded power cable for leads extending from VFDs to motors, where indicated.

3.3 SIGNAL CABLING

A. Circuit runs shall be of individually shielded twisted pairs or triads. In no case shall a circuit be made up using conductors from different pairs or triads. Triads shall be used wherever 3-wire circuits are required. Terminal blocks shall be provided at instrument cable junctions unless otherwise specified. Signal circuits shall be run without splices between instruments, terminal boxes, or panels.

B. Shields shall not be used as a signal path, except for coaxial cable circuits operating at radio frequencies.

C. Unless otherwise specified, shields shall be bonded to the signal ground bus at the control panel and isolated from ground and other shields at other locations. Terminals shall be provided for running signal leads and shield drain wires through junction boxes.

D. Spare circuits shall be terminated on terminal blocks at both ends of the cable run and be electrically continuous through terminal boxes. Shield drain wires for spare circuits shall not be grounded at either end of the cable run. Terminal boxes shall be provided at instrument cable splices. If cable is buried or in raceway below grade at splice, an instrument stand shall be provided as specified with terminal box mounted approximately 3 feet above grade.

E. Cable for paging, telephone, and security systems shall be installed and terminated in compliance with the manufacturer’s recommendations.

3.4 COLOR CODING

A. Wiring shall conform to the following color code, unless otherwise specified.

B. Insulation on phase conductor sizes 8 AWG and smaller shall be colored, 6 AWG and larger may have black insulation with plastic tape of the appropriate color from the table below.

C. Insulation on the grounded conductor (neutral) sizes 6 AWG and smaller shall be colored;4 AWG and larger may have black insulation with plastic tape of white or gray in accordance with the table below.

Description	**208Y/120V**	**480Y/277V**	**Control**
Phase A (Left, Top, Front)	Black	Brown	--
Phase B (Center, Center, Center)	Red	Orange	--
Phase C (Right, bottom, Back)	Blue	Yellow	--
Neutral	White	Gray	White
Ground	Green	Green	Green
120 VAC Control	--	--	Red
120 VAC Control	Neutral	--	White
DC Control (+)	--	--	Purple
DC Control (-)	--	--	Gray
External Source	--	--	Yellow

D. All control wiring in control panels or other enclosures that is powered from an external source and is not disconnected by the control panel disconnect shall be terminated at a disconnecting terminal block upon entering the enclosure. The color of the wire shall then be changed to yellow to identify it as being powered from an external source. Provide identification nameplate on exterior of enclosure to indicate sources of external power.

3.5 TERMINAL MARKING

A. All terminals in instrument and relay compartments, motor control centers, in control panels, instrument panels, field panels and control stations, as well as connections to mechanical equipment shall have reference number and letter.

3.6 WIRE BENDING RADIUS

A. The radius of bends in all non-shielded wire (conductors and cables) shall not be less than eight (8) times the outside diameter of the wire. Shielded or lead covered wire shall not be bent to a radius less than twelve (12) times the diameter of the wire. Any wire installed with bends less than the allowed diameter and which the Engineer deems has caused that insulation to be damaged, shall be removed and new wire shall be installed.

3.7 GENERAL TESTS

A. The Contractor shall perform voltage, current and resistance tests as required in this section. Test reports shall be submitted to the Engineer prior to final acceptance by the Owner. The Contractor shall inform the Engineer of scheduled testing a minimum of 5 days prior to the testing.

B. The Contractor shall undertake all such corrective measures if the test results

indicate corrective measures are required. No additional compensation will be paid for corrective measures

C. Test Scope

1. The Contractor shall provide all material, equipment, labor and technical supervision to perform tests and inspections as specified herein.
2. It is the intent of these tests to assure that all electrical equipment as supplied and installed by the Contractor is operational within the industry and manufacturer's tolerances and is installed in accordance with the design documents.
3. The tests and inspection shall determine the suitability for energization.

D. Conductor Tests

1. Following the completion of installation, the following conductors shall be tested:
   a. All power feeders scheduled in Conduit and Cable Schedule.
   b. Service conductors and feeder conductors
   c. All new grounding; measure ground resistance at each ground rod.

E. Visual and Mechanical Inspections

1. Inspect exposed section for physical damage.
2. Verify cable is supplied and connected in accordance with specifications and one line diagram, and that phases are labeled correctly.

F. Electrical Tests

1. Perform insulation resistance test on each cable in reference to ground and adjacent conductors in the same raceway.
2. Perform continuity test to ensure proper cable connection.

G. Test Values

1. Insulation resistance tests shall be performed at 1000 volts DC for one-half minute.
2. Minimum megger readings at 20 degrees C shall be one megohm.
3. The maximum acceptable reading for an individual ground rod shall be 25 ohms as required by the NEC and measured by the three rod method. The composite ground electrode shall have a maximum acceptable reading of 15 ohms.

END OF SECTION 16120

SECTION 16170
DISCONNECTS AND SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies all disconnects, fused and unfused, required by code for equipment furnished under this and other Divisions of these specifications.

1.2 STANDARDS AND CODES

A. All equipment, materials, and the design, construction, installation, and application thereof shall comply with all applicable provisions of the national electrical code (NEC), the occupational safety and health act (OSHA), and any applicable federal, state, and local ordinances, rules and regulations. All materials and equipment specified herein shall be within the scope of nationally recognized testing laboratory (NRTL) examination services, be approved by the NRTL for the purpose for which they are used, and shall bear the appropriate listing label.

1.3 SUBMITTALS

A. Submit all catalog data In accordance with the Submittals requirements in Section 16010.1.12. Show material information and confirm compliance with these Specifications.

PART 2 - PRODUCTS

2.1 DISCONNECTS

A. Disconnect switches shall be heavy duty type, shall be horsepower rated, quick-make, quick-break construction. Switch blades shall open all ungrounded conductors and shall be single throw, unless otherwise noted.

B. Disconnect switch enclosures shall be suitable for location in which mounted in accordance with Section 16010.1.10.

C. Fusible disconnects shall be as specified above with fuse space and clips to accept Class R fuses. Fusible disconnects shall only be utilized where required by equipment manufacturer to meet UL installation requirements.

2.2 MANUFACTURER

A. Disconnect switches shall be manufactured by Cutler Hammer, Square D, Westinghouse, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Switches shall be mounted at locations shown on plans. Installation shall be in accordance with the following methods:

1. Mounting
   a. Disconnects shall be fastened securely to supporting structure at walls and stands:
   b. Wood screws or lag screws to wood boards or timbers
   c. Machine bolt to metal framing or plates
   d. Expansion anchors to concrete walls
   e. Expansion toggle wing bolts or sleeve anchors to hollow block
   f. Provide 1 inch spacers to set enclosure out from concrete or block wall
2. Stands and Supports
   a. Disconnect stands and support shall be constructed of and secured by:
   b. Corrosion-resistant materials and finishes
   c. Unistrut-type materials for fabrication
   d. Expansion anchors for bolts in concrete floor
   e. Machine bolt to metal framing or plates
   f. Wood screws or lag screws to wood boards or timber
   g. Backing plate for mounting units.
   h. Fasten stand securely to floor
   i. Dimensions as required by equipment to be mounted
3. Arrangement
   a. Disconnects shall be arranged for driven equipment use or function:
   b. Similar units adjacent
   c. Adequate space for operation and servicing
4. Mounting Height
   a. Center of handle shall be 4 feet 6 inch above the finished floor or work platform.

3.2 IDENTIFICATION

A. Nameplates shall be provided for all disconnects in accordance with Section 16010.2.2.

B. Nameplate to state load designation and power source equipment.

END OF SECTION 16170

SECTION 16200
STANDBY DIESEL GENERATOR

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies standby diesel power generator set, including diesel engine-driven generator with controls, output circuit breaker and all required auxiliary systems.

A. General

1. The generator set shall be a complete, factory-assembled power generating system including a diesel engine, radiator-type engine cooling system, engine exhaust system, engine fuel system, engine speed control system, engine starting system, generator, generator regulator system, control panel, main circuit breaker, structural steel support frame assembly, fuel tank, automatic transfer switch and all other components and ancillary devices required for a complete, operable system.
2. The generator set shall be designed by the manufacturer and all components of the generator set shall be selected by the manufacturer to:
3. Be an integrated electrical generating system with compatible components and all required controls and appurtenances.
4. Continuously produce the kVA demanded by the load described on the drawings and in these specifications for any duration of interruption of the normal utility source.

B. Regulatory Requirements

1. All materials and equipment specified herein shall be within the scope of Nationally Recognized Testing Laboratory (NRTL) examination services, be approved by the NRTL for the purpose for which they are used, and shall bear the appropriate listing label.
2. Equipment listed/labeled by an NRTL shall be as dictated by the latest printing of the Electrical Testing Laboratories Accreditation Report available from the State of Washington Department of Labor and Industries, Electrical Inspection Division. Any NRTL listing/labeling shall be as accepted by the local authority having jurisdiction.
3. When a product is not available with a testing laboratory listing for the purpose for which it is to serve, the product may be required by the inspection authority to undergo a special inspection at the manufacturer's place of assembly. All costs and expenses incurred for such inspections shall be included in the original contract price.

C. Required Performance

1. The performance of the generator set shall be based on operation of the assembly with fan, battery charging alternator and all specified and

required appurtenances.

2. The generator set shall be rated for continuous standby service, however the temperature rise of the generator shall not exceed 105 degrees C above a 40 degree C ambient, when producing full rated load for a continuous period of time.

3. The engine generator unit supplied must start the indicated loads with a sustained RMS voltage drop no greater than 25% of rated phase to phase voltage during the starting period. The starting period shall be from zero up to 3 seconds. The instantaneous voltage dip may be greater than 25% but shall not cause motor starter chatter or relay drop out or exceed a level which causes undesirable motor starting. If motor starting problems are encountered the size of the generator set shall be increased as required to reduce voltage dip until the motors can be started without problems. No additional cost shall be incurred by the Owner for the increased size of the generator set. The method of measurement shall be by light beam oscilloscope.

4. Frequency regulation shall be plus or minus 3 hertz maximum, no load to rated load. Voltage regulation shall be plus or minus 2% maximum.

5. The generator set shall be sized by the manufacturer to start and operate the load indicated herein while meeting the performance requirements set forth herein. The minimum acceptable engine generator set shall be capable of producing power for the loads and ratings indicated on the drawing at .8 power factor, continuously.

6. The generator set output voltage shall be 480V/277Y, 3 Phase, 60 hertz.

D. Submittals

1. In accordance with the Submittals requirement in Section 16010, the following information shall be submitted by the Contractor prior to placement of a purchase order for the equipment:

   a. Wiring diagrams with details specific to this project showing all interface points and terminal numbers clearly identified.

   b. Specific information on the components provided for this project and all optional equipment provided.

   c. Operations and programming/adjustments manual.

   d. Specific detailed information on the control features, their ranges, recommended set points etc.

   e. Detailed plan and elevation drawings of the generator set indicating overall dimensions and the specific location of all components, including the engine exhaust system, fuel tank, and enclosure.

   f. Detailed drawings indicating installation requirements and the specific location of vibration isolators and seismic snubbers.

   g. Detailed plan of the face of the control panel indicating overall dimensions and the specific location of all components.

   h. Detailed specifications and standard operating characteristics of

the engine, the generator and all components.

i. Certification by the manufacturer and documentation that appropriate linear and torsional vibration analyses have been performed and that engine and generator are compatible units.

j. Certification by the manufacturer and documentation that the generator set will meet or exceed the general requirements as specified in Paragraph 1.02 of this section and the required performance as specified in Paragraph 1.04 of this section.

k. Generator control schematic.

l. Engine control schematic.

m. Certification by the engine manufacturer of review and approval of the proposed engine application.

n. Certification by the generator manufacturer of review and approval of the proposed generator application.

o. Detailed specifications and drawing of the diesel fuel tank.

p. Detailed specifications and drawings of the installation of the engine exhaust system.

q. Detailed drawing showing generator plan and elevation views as proposed to be installed in the building, including all required electrical and mechanical Code clearances.

2. Installation details shall include the size, number, type and location of vibration isolators, seismic snubbers and anchor bolts; the size, number, type and location of interconnecting wiring and conduit; installation of the generator set and all appurtenances (including exhaust system), and other installation requirements. Shop drawings shall be submitted to the Contractor for review and approval.

3. After break-in and testing of the generator set, the following project data shall be submitted by the Contractor:

a. Certified results of testing of the engine by the engine manufacturer.

b. Certified results of testing of the generator by the generator manufacturer.

c. Certified results of break-in and testing of the generator set by the manufacturer of the assembly.

E. Warranty

1. The Contractor shall guarantee the generator set to be free of defects in design, materials and workmanship for a period of five (5) years following the date of acceptance, by formal action of the Owner, of all work under the contract. The guarantee shall include all parts and labor and shall be secured by a written guarantee from the manufacturer to the Owner. The written guarantee shall be delivered to the Owner prior to date of acceptance of all work under the Contract.

PART 2 - PRODUCTS

A. Acceptable Manufacturers

The generator set shall be manufactured by one of the following acceptable manufacturers:

1. CATERPILLAR
2. CUMMINS ONAN
3. KOHLER
4. The dimensional data for the sizing of the generator is from CUMMINS ONAN. The equipment of the manufacturer selected must fit within the space restrictions as shown on the plans and operate the equipment specified.

B. Generator set

1. Ratings
   a. The generator set shall operate at a voltage of: 277Y/480V, 3 Phase, 60 hertz.
   b. The generator set shall be rated as shown on the one line diagram, based on site conditions of: Altitude Sea level, ambient temperatures up to 100 degrees F.
   c. The generator set rating shall be based on standby service.

C. Performance

1. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.5%.
3. The diesel engine-generator set shall accept a single step load of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
4. Motor starting capability shall required for the loads shown on the drawings. The generator set shall be capable of recovering to a minimum of 90% of rated no load voltage following the application of the specified kVA load at near zero power factor applied to the generator set. Maximum voltage dip on application of this load, considering both alternator performance and engine speed changes shall not exceed 25%.
5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3rd order harmonics or their multiples.

6. The generator set shall be certified by the engine manufacturer to be suitable for use at the installed location and rating, and shall meet all applicable exhaust emission requirements at the time of commissioning.

D. Construction

1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.

2. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. All active control components shall be installed within a UL/NEMA 3R enclosure. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.

E. Connections

1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.

2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel.

3. Generator set control interfaces to other system components shall be made on a permanently labeled terminal block assembly. Labels describing connection point functions shall be provided.

F. Engine

1. The engine shall be diesel, 4 cycle, radiator and fan cooled. The horsepower 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:

   a. 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, accelerating to rated speed. The governing system shall include a programmable warm up at idle and cooldown at idle function. While operating in idle state, the control system shall disable the alternator excitation system.

   b. Skid-mounted radiator and cooling system rated for full load operation in 122 degrees F (50 degrees C) ambient 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 is 20F 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.

c. Electric starter(s) capable of three complete cranking cycles without overheating.

d. Positive displacement, mechanical, full pressure, lubrication oil pump.

e. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.

f. An engine driven, mechanical, positive displacement fuel pump. 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.

g. Replaceable dry element air cleaner with restriction indicator.

h. Flexible supply and return fuel lines.

i. Engine mounted battery charging alternator, 40-ampere minimum, and solid-state voltage regulator.

G. Coolant Heater

a. Engine mounted, thermostatically controlled, coolant heater(s) for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 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. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall 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 104F (40C) in a 40F (4C) ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.

e. Provide vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.

f. Starting and Control Batteries shall be calcium/lead antimony type, 24 volt 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 40F ambient temperature when fully charged.

g. Specify special silencer type if required by the application.

h. Provide 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.

i. Provide a minimum 12 amp battery charger for each generator set battery bank. Generator sets incorporating two battery banks shall be provided with two chargers connected together and operating in parallel, with alarm output(s) connected in parallel. The charger(s) shall include the following capabilities:

    1) Chargers shall be UL 1236-BBHH listed and CSA or CUL certified for use in emergency applications.

    2) The charger shall be compliant with UL991 requirements for vibration resistance.

    3) The charger shall comply with the requirements of EN61000-4-5 for voltage surge resistance; EN50082-2 for immunity; EN61000-4-2 for ESD; EN61000-4-3 for radiated immunity; ANSI/IEEE C62.41 category B and IN61000-4-4 for electrically fast transient; EN61000-4-6 for conducted emissions; and FCC Part 15 Class A for radiated emissions.

    4) The charger shall be capable of charging a fully discharged battery without damage to the charger. It shall be capable of returning a fully discharged battery to fully charged condition within 24 hours. The charger shall be UL-labeled with the maximum battery amp-hour rating that can be recharged within 24 hours. The label shall indicate that the charger is suitable for charging of 200AH batteries per NFPA requirements.

    5) The charger shall incorporate a 4-state charging algorithm, to provide trickle charge rate to restore fully discharged batteries, a bulk charge rate to provide fastest possible recharge after normal discharge, an absorption state to return the battery to 100 percent of charge, and a float stage to maintain a fully charge battery and supply battery loads when the generator set is not operating. In addition,

the charger shall include an equalization timer. Charge rates shall be temperature compensated based on the temperature directly sensed at the battery.

6) The DC output voltage regulation shall be within plus or minus 1%. The DC output ripple current shall not exceed 1 amp at rated output current level.

7) The charger shall include the following features:

a) Two line alphanumeric display with programming keys to allow display of DC output ammeter and voltmeters (5% accuracy or better), display alarm messages, and perform programming;

b) LED indicating lamp(s) to indicating normal charging condition (green), equalize charge state (amber), and fault condition (red);

c) AC input overcurrent, over voltage, and undervoltage protection;

d) DC output overcurrent protection;

e) Alarm output relay

f) Corrosion resistant aluminum enclosure

H. AC Generator

1. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system and shall be UL1446 listed.

2. 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.

3. 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% of rated current for not more than 10 seconds.

4. The subtransient reactance of the alternator shall not exceed 15 percent, based on the standby rating of the generator set.

I. Generator set Control

1. The generator set shall be provided with a microprocessor-based control system that is 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 specification.

2. The control shall be mounted on the generator set, or may be mounted in a free-standing panel next to the generator set if adequate space and accessibility is available. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

3. The generator set mounted control shall include the following features and functions:

   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 is 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. 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 be locked out from automatic restarting.

   c. 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. 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.

J. Generator Set AC Output Metering.

1. The generator set shall be provided with a metering set including the following features and functions:

   a. Digital metering set, 1% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, 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. Analog voltmeter, ammeter, frequency meter, power factor meter, and kilowatt (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% at rated output. Both analog and digital metering are required.

   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 to 110% of rated load, in 10% increments. The control shall display hours of operation at less than 30% load and total hours of operation at more than 90% 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.

K. Generator Set Alarm and Status Display.

1. The generator set control shall include 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:

   a. The control shall include five configurable alarm-indicating lamps. The lamps shall be field adjustable for any status, warning, or shutdown function monitored by the genset. They shall also be configurable for color, and control action (status, warning, or shutdown).

   b. The control shall include 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.

   c. The control shall include a flashing red lamp to indicate that the control is not in automatic state, and red common shutdown lamp.

   d. The control shall include an amber common warning indication lamp.

2. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. All conditions indicated below for warning shall be field-configurable for shutdown. Conditions required to be annunciated shall include:

   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. low fuel-daytank (warning)

q. high AC voltage (shutdown)

r. low AC voltage (shutdown)

s. under frequency (shutdown)

t. over current (warning)

u. over current (shutdown)

v. short circuit (shutdown)

w. over load (warning)

x. emergency stop (shutdown)

y. (4) configurable conditions

z. Provisions shall be made for indication of four customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above-specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

L. Engine Status Monitoring.

1. The following information shall be available from a digital status panel on the generator set control :

   a. engine oil pressure (psi or kPA)

   b. engine coolant temperature (degrees F or C)

   c. engine oil temperature (degrees F or C)

   d. engine speed (rpm)

   e. number of hours of operation (hours)

   f. number of start attempts

   g. battery voltage (DC volts)

2. 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.

M. Engine Control Functions

1. The control system provided shall include a cycle cranking system, which

allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15-second rest period between cranking periods.

2. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.

3. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.

4. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.

5. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.

N. Alternator Control Functions:

1. The generator set shall include a full wave rectified automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and 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 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 be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.

2. A microprocessor-based protection device shall be provided to individually monitor all phases of the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The device shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.

3. A microprocessor-based protection device shall be provided to monitor all 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 to the requirements of NFPA70 article 445.

4. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.

5. A microprocessor-based 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% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds. The system shall monitor individual phases and be connected line to neutral on 3-phase 4-wire generator sets, and for systems that are solidly grounded.

6. When required by National Electrical Code or indicated on project drawings, the control System shall include a ground fault monitoring relay. The relay shall be adjustable from 3.8-1200 amps, and include adjustable time delay of 0-10.0 seconds. The relay shall be for indication only, and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay that will function correctly in system as installed.

7. The generator set control shall include a 120VAC-control heater.

O. Control Interfaces for Remote Monitoring:

1. The control system shall provide four programmable output relays. These relay outputs shall be configurable for any alarm, shutdown, or status condition monitored by the control. The relays shall be configured to indicate: (1) generator set operating at rated voltage and frequency, (2) common warning, (3) common shutdown, (4) load shed command.

2. A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.

3. A fused 10 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.

P. Additional equipment

1. Output Circuit Breaker and Disconnecting Means

   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 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.

Q. Sound Attenuated Enclosure

1. The generator set enclosure shall be sound-attenuated and allow the generator set to operate at full rated load in an ambient temperature of up to 100F. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 75 dBA at any location 7 meters from the generator set in a free field environment.

2. The enclosure shall be insulated with non-hydroscopic materials.

3. The generator set enclosure shall be listed under UL2200. The package shall comply with the requirements of the National Electrical Code for all 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 100F. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure.

4. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electrocoating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:

   a. Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.

   b. Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.

   c. Crosshatch adhesion, per ASTM D3359-93, 4B-5B.

   d. Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.

   e. Salt Spray, per ASTM B117-90, 1000+ hours.

   f. Humidity, per ASTM D2247-92, 1000+ hours.

   g. Water Soak, per ASTM D2247-92, 1000+ hours.

5. Painting of hoses, clamps, wiring harnesses, and other non-metallic 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.

6. Enclosure shall be constructed of minimum 12 gauge steel for framework and 14 gauge steel for panels. All hardware and hinges shall be stainless steel.

7. 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.

8. The enclosure shall include the following maintenance provisions:

9. Flexible coolant and lubricating oil drain lines, that extend to the exterior of the enclosure, with internal drain valves

10. External radiator fill provision.

R. Fuel tank

1. Provide a sub-base fuel tank for the generator set, sized to allow for full load operation of the generator set for a minimum of 24 hours. The sub-base fuel tank shall be UL142 listed and labeled. Installation shall be in compliance to NFPA37. The fuel tank shall be a double-walled, steel construction and include the following features:

   a. Emergency tank and basin vents.

   b. Mechanical level gauge.

   c. Fuel supply and return lines, connected to generator set with flexible fuel lines as recommended by the engine manufacturer and in compliance to UL2200 and NFPA 37 requirements.

   d. Leak detection provisions, wired to the generator set control for local and remote alarm indication.

   e. High and low level float switches to indicate fuel level. Wire switches to generator control for local and remote indication of fuel level

   f. Basin drain.

   g. Integral lifting provisions.

PART 3 - EXECUTION

3.1 FACTORY TESTING

A. 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.

B. 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: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

C. Installation

1. Equipment shall be installed by the contractor in accordance with final submittals and 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 furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall 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. All 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 all dirt and construction debris prior to initial operation and final testing of the system.

D. Acceptance testing

1. The complete installation shall be tested for compliance with the specification following the completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.
2. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two hour full load test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.
3. 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.
4. The Contractor shall provide fuel for startup testing, calibration and adjustment. The Contractor shall provide the Owner with a full tank of fuel upon completion of the project.

E. Training

1. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

F. Service and support

1. The manufacturer of the generator set shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.
2. The location of the service center shall be located within 50 miles of the project location.
3. The generator set shall be serviced by a local service organization that is 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.
4. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

G. Warranty

1. The generator set and associated equipment shall be warranted for a period of not less than 5 years from the date of commissioning against defects in materials and workmanship.
2. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

END OF SECTION 16200

SECTION 16450
GROUNDING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This specification describes the requirements for the grounding of electrical systems and equipment.

B. Installation shall be in accordance with the National Electrical Code (NEC).

PART 2 - PRODUCTS

2.1 MATERIALS

1. Ground wire: Soft drawn bare stranded copper wire, sized as noted on the drawings.
2. Terminals and connectors: Burndy Hyground compression system.
3. Exothermic type weld: Erico Cadweld process, or Furseweld/T&B corp. Exothermic welding system.
4. Rod Electrodes: Copper clad (minimum 0.010 jacket) ground rods minimum ¾" diameter x 8' long.
5. Grounding Electrode conductors and bonding conductors: Copper conductors, bare or insulated, as shown on drawings.

PART 3 - EXECUTION

3.1 PREPARATION

1. All contacting surfaces of ground connections shall be cleaned to bright metal before connection is made.

3.2 INSTALLATION

1. Grounding conductors: Install in PVC conduit where subject to damage. All grounding conductors smaller than #6 AWG must be protected.
2. Connections and splices: Provide as required and as shown on drawings.
3. Connections, taps, and splices shall be made by compression connectors, Burndy Hyground compression system.
4. Provide equipment grounding conductor in all PVC conduits.

END OF SECTION 16450

SECTION 16496
AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section specifies the requirements of all automatic transfer switches in individual enclosures for system rated 600 volts and less.

B. Provide complete factory assembled power transfer equipment with electronic controls designed for designed for fully automatic operation and including: surge voltage isolation, voltage sensors on all phases of the normal source and one phase of the emergency source, positive mechanical and electrical interlocking, and mechanically held contacts for both sources.

1.2 STANDARDS AND CODES

A. All equipment, materials, and the design, construction, installation, and application thereof shall comply with all applicable provisions of the National Electrical Code (NEC), the Occupational Safety and Health Act (OSHA), and any applicable federal, State, and local ordinances, rules and regulations. All materials and equipment specified herein shall be within the scope of Nationally Recognized Testing Laboratory (NRTL) examination services, be approved by the NRTL for the purpose for which they are used, and shall bear the appropriate listing label.

B. The automatic transfer switch shall conform to the requirements of the following codes and standards:

1. UL1008. The transfer switch shall be UL listed and labeled.
2. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
3. CSA 282, Emergency Electrical Power Supply for Buildings
4. IEEE Standard C62.41 and C62.45.
5. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
6. NFPA99 – Essential Electrical Systems for Health Care Facilities
7. NFPA110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems.
8. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
9. NEMA ICS10-1993 – AC Automatic Transfer Switches.

1.3 RELATED DOCUMENTS

A. Related Documents: the provisions and intent of the Contract, the General and

Supplementary Conditions, and Section 01 specification Sections, apply to the Work as if specified in this Section.

B. Related Sections:

1. Section 16010 for enclosure and cabinet supports.

1.4 COORDINATION

A. The Electrical Contractor shall be responsible for furnishing and installing the automatic transfer switch, interconnecting wiring, and all related equipment as shown on the drawings and as specified herein.

1.5 REFERENCES

A. ANSI/NEMA ICS 10 (National Electrical Manufacturers Association) – AC Transfer Switch Equipment.

B. ANSI/UL 1008 – Automatic Transfer Switches.C. NETA ATS (International Electrical Testing Association) – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum 10 years documented experience, and with service facilities within 100 miles of Project site capable of providing training, parts, and emergency maintenance and repairs.

B. Supplier: Authorized distributor of specified manufacturer with minimum 10 years documented experience.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100 and marked for intended use for the location and environment in which they are installed.

D. Comply with NFPA 70, as adopted and administered by the Authority Having Jurisdiction.

1.7 SUBMITTALS

A. Comply with Section 16010, Electrical General.

B. Product Data: Submit catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details. Include mounting and anchorage requirements to maintain seismic compliance. Include compliance with seismic rating and labeling requirements.

C. Seismic Qualification Certification: Submit certification that transfer switches, accessories, and components will withstand seismic forces as required by local codes. Include the following:

1. Basis of Certification: Verify whether withstand certification is based on actual test of assembled components.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Operations and Maintenance Data: Comply with Section 16010 Operations and Maintenance Data.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure, and finish.

1.9 WARRANTY

A. The Contractor shall guarantee the ATS set to be free of defects in design, materials and workmanship for a period of five (5) years following the date of acceptance, by formal action of the Owner, of all work under the contract. The guarantee shall include all parts and labor and shall be secured by a written guarantee from the manufacturer to the Owner. The written guarantee shall be delivered to the Owner prior to date of acceptance of all work under the Contract.

PART 2 - PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH

A. GENERAL

1. Provide One (1) automatic system load transfer switch. Unless otherwise specified, the Automatic Transfer Switch manufacturer shall be the same as the Generator manufacturer.

B. Ratings

1. Refer to the project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, number of poles, voltage and ampere ratings, enclosure type, and accessories.
2. Main contacts shall be rated for the operation voltage as installed.
3. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000M).
4. Transfer switch equipment shall have withstand and closing ratings

(WCR) in RMS symmetrical amperes greater than the available fault currents shown on the drawings. The transfer switch and its upstream protection shall be coordinated. The transfer switch shall be third party listed and labeled for use with the specific protective device(s) installed in the application.

C. CONSTRUCTION

1. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the source 1 and source 2 positions.
2. Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.
3. Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with line voltage components.
4. Transfer switches shall be 3-pole and shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.

D. CONNECTIONS

1. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
2. Transfer switch shall be provided with mechanical lugs sized to accept the full output rating of the generator set.

E. CONTROL

1. Solid-state under voltage sensors shall simultaneously monitor both sources. Pick-up and drop-out settings shall be adjustable. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage.
2. Automatic controls shall signal the engine-generator set to start upon signal from normal source sensor. Solid-state time delay start, adjustable from 0 to 15 seconds (factory set at 2 seconds) shall avoid nuisance start-ups. Battery voltage starting contacts shall be silver, dry type contacts factory wired to a field wiring terminal block.
3. The switch shall transfer when the emergency source reaches the set point. Provide a solid-state time delay on transfer, adjustable from 2 to 120 seconds, factory set at 3 seconds.
4. The switch shall retransfer the load to the normal source after a time delay retransfer, adjustable from 6 seconds to 30 minutes, factory set at 5 minutes. Retransfer time delay shall be immediately bypassed if the emergency power source fails.

5. Controls shall signal the engine-generator set to stop after a time delay, adjustable from 2 seconds to 10 minutes, and factory set at 5 minutes, beginning on return to the normal source.

6. The control system shall include field adjustable provisions to control the speed of transfer of the transfer switch.

7. Power for transfer operation shall be from the source to which the load is being transferred.

8. The control shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time.

F. FRONT PANEL DEVICES:

1. Provide control switches mounted on cabinet front for:

   a. Test - Simulates normal power loss to control for testing of generator set. Controls shall provide for a test with or without load transfer.

   b. Retransfer - Momentary position to override retransfer time delay and cause immediate return to normal source, if available.

   c. Provide LED-type switch position and source available indicator lamps on the front of the transfer switch cabinet.

   d. Provide manual override switch to bypass the control system and transfer load from source to source when control is disabled.

G. CONTROL INTERFACE

1. The transfer switch will provide an isolated relay contact for starting of a generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C, for compatibility with any generator set.

2. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.

3. The transfer switch shall provide relay contacts to indicate the following conditions: source 1 available, load connected to source 1, source 2 available, source 2 connected to load.

H. ENCLOSURE

1. Enclosures shall be UL listed. The cabinet door shall be key-locking.

2. Transfer switch equipment shall be provided in a NEMA 12 enclosure for indoor installations, or NEMA 3R enclosure for outdoor installations, or as shown on the plans.

3. Enclosures shall be the NEMA type specified. The cabinet shall provide code-required wire bend space at point of entry as shown on the drawings. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual

operating handles and/or non key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.

2.2 OPERATION

A. Open Transition Sequence of Operation

1. Transfer switch normally connects an energized utility power source (source 1) to loads and a generator set (source 2) to the loads when normal source fails. The normal position of the transfer switch is source 1 (connected to the utility), and no start signal is supplied to the genset.

2. Generator Set Exercise (Test) With Load Mode. The control system shall be configurable to test the generator set under load. In this mode, the transfer switch shall control the generator set in the following sequence:

   a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.

   b. When the control systems senses the generator set at rated voltage and frequency, it shall operate to connect the loads to the generator set by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.

   c. The generator set shall operate connected to the load for the duration of the exercise period. If the generator set fails during this period, the transfer switch shall automatically reconnect the generator set to the normal service.

   d. On completion of the exercise period, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.

   e. The transfer switch shall operate the generator set unloaded for a cooldown period, and then remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

3. Generator Set Exercise (Test) Without Load Mode. The control system shall be configurable to test the generator set without transfer switch load connected. In this mode, the transfer switch shall control the generator set in the following sequence:

   a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.

   b. When the control systems senses the generator set at rated voltage and frequency, it shall operate the generator set unloaded for the duration of the exercise period.

c. At the completion of the exercise period, the transfer switch shall remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install transfer switch on equipment rack as shown and indicated on drawings and complying with Section 16010.

B. Comply with manufacturer's recommendations, drawings, and mounting and anchoring requirements.

C. Ground equipment.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

E. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Mark lugs after torquing with red paint such that paint will be visibly disturbed if lugs are disturbed.

3.2 IDENTIFICATION

A. Identify transfer switch, transfer switch components, and control wiring according to Section 16010 "Electrical-General."

B. Identify transfer switch name, designation, power sources, source locations, voltage, load served and load location.

C. Equipment used in emergency systems shall be labeled "Suitable for use on emergency systems" per NEC 700-3.

D. Operating Instructions: Include printed operating instructions for transfer switch, including control sequences and emergency procedures, inside door pocket or readily accessible location.

END OF SECTION 16496

SECTION 16925
INSTRUMENTATION AND CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section covers and includes the general requirements for furnishing, installing, adjusting, testing, documenting, and startup of the complete and functional waste water pump control system.

B. Major components of this system include, but are not limited to, all materials, equipment, and work required to implement a complete and operating system as described herein. The system shall include a complete electrical enclosure with operator interface, instrumentation, pump starters and all hardware and software required to program, calibrate and monitor the control devices.

C. An existing PLC controller with radio telemetry will be relocated and utilized for the automatic pump control and remote monitoring. Contractor shall provide one 16 point digital input expansion module. PLC, telemetry, and operator interface programming will be provided by the City's Programmer (L2 Systems), under force account.

D. The Contractor shall provide, calibrate, set up and test the complete control system. The Contractor shall place the completed system in operation, including testing and making final adjustments to instruments and equipment as required during system start-up. The Contractor shall provide the services of trained and qualified instrument technicians for these services.

1.2 RELATED SECTIONS

A. 16010 – Electrical General

1.3 DEFINITION OF TERMS

A. General – Refer to Standard abbreviations, Section 16010.3.7.

B. System Integrator: An organization engaged in the business of detail design, component selection and procurement, fabrication, wiring, assembly, programming and testing process control systems.

C. Contractor: The party who furnishes and installs all tools, materials, and equipment to complete the work shown and implied in the drawings and these specifications. This includes the Prime Contractor, the Electrical Contractor, System Integrator, and all other Contractors and Subcontractors.

1.4 SPECIAL REQUIREMENTS

A. The Contractor shall install components including those assembled and setup by the System Integrator at the locations shown in the plans, and in accordance with the requirements of Division 16.

B. The Contractor shall be responsible for the selection of the System Integrator, and shall be subject to approval by the Engineer. The Electrical Contractor may serve as the System Integrator, if the requirements of these specifications are met. It is recommended that the System Integrator be a control system manufacturing company that conforms to the following requirements:

1. The System Integrator's manufacturing and testing facility shall be located within a 150 mile drive from the project location.
2. The System Integrator shall be specialized in the design, assembly, testing, installation and service of municipal control systems for at least the last five years.
3. The System Integrator shall employ technicians and engineers with documented experience in the design, assembly, testing, installation, operation, calibration, trouble-shooting, service and repair of control and communication systems for municipal systems and facilities.
4. The System Integrator shall have completed the design, assembly, testing and installation of control systems which include the instruments and devices cited on the Plans by specific manufacturer's name.
5. The System Integrator shall be a UL listed and certified control panel manufacturing facility.

1.5 DIVISION AND ASSIGNMENT OF RESPONSIBILITY

A. Systems Responsibility

1. All materials and modifications to the existing control system shall be provided under the supervision of a single Contractor, which is regularly engaged in the design and installation of such systems of similar scope and complexity.
2. The Contractor shall be fully and completely responsible for all work performed and all materials installed under the contract. The contract between the Contractor and subcontractor(s) shall conform to and meet all requirements specified in the contract documents.

B. System Integrator's Responsibilities

The System Integrator shall be responsible for the following equipment and services:

1. Provide the instrumentation shown on the drawings.
2. Provide the complete, wired, tested and labeled Electrical Enclosure.
3. Coordinate with the electrical contractor for specific connection requirements and locations of raceways and field wiring in control panels.
4. Set up, configuration, testing, and verification of all control equipment.
5. Assist City's programmer (L2 Systems) with testing of all automatic control and monitoring functions.
6. System start up, functional testing and training following installation.

C. Electrical Contractor's Responsibility

The Electrical Contractor shall be responsible for the following equipment and services:

1. Installation of the Control System components in accordance with these documents, drawings or instructions of the System Integrator.
2. Coordination with the Engineer and Owner for the equipment installation and pump station downtime requirements.

1.6 SUBMITTALS

A. Hardware Submittals

In addition to the requirements stated elsewhere in these documents, the following information shall be provided:

1. Before any components are purchased, fabricated, and/or integrated into assemblies, or shipped to the site, the System Integrator shall prepare a complete hardware submittal.
2. Provide hard copies of submittal to the Engineer for review, including fully detailed shop drawings, catalog cuts, bill of materials, wiring connections, and such other documentation as may be required to fully describe the equipment and to demonstrate its conformity to these plans and specifications. Catalog information shall be submitted for all components and equipment required for the project.
3. All submittals shall be complete, organized, and indexed. Partial submittals will not be accepted.

B. System Drawing Submittals

1. Following approval of the Hardware Submittal, the System Integrator shall prepare complete system interconnect wiring diagrams and panel layout drawings for approval.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Provide Operation and Maintenance (O&M) data for the complete control system and related equipment, in accordance with the general requirements in Section 16010.

PART 2 - PRODUCTS

2.1 GENERAL

A. Material shall be new, free from defects, and of the quality specified. All equipment and materials utilized in the system shall be the products of manufacturers with at least five (5) years' experience in the manufacture of similar equipment. Similar items in the system shall be the products of the same manufacturer. All equipment shall be of industrial grade and shall be specifically intended for control and monitoring of operation of motor-driven pumps and equipment. All equipment shall

be of modular design to facilitate interchangeability of parts and to assure ease of servicing.

2.2 CONTROL PANELS

A. Control Panels - General

1. Control panels shall be designed, assembled, tested and placed into operation by the System Integrator. The control panel shall fit into the space requirements as shown on the drawings. The contract drawings show general control panel layout and space requirements. Final dimensions shall be selected by the System Integrator to adequately install and wire the required control equipment. Detailed panel layout and interconnecting drawings shall be submitted prior to ordering of materials, and shall be subject to review and approval by the Engineer.
2. The enclosure sizes shall be selected be the System Integrator to provide adequate space and arrangement for all equipment shown on the drawings, and shall be submitted to the Engineer for approval.
3. Enclosures shall be manufactured by Hoffman, Hammond, or equal.

B. OPERATING AND INDICATING DEVICES

Operating and indicating devices minimum rating shall be NEMA 13. Operator devices mounted in outdoor panels, corrosive areas or where exposed to moisture shall be NEMA 4X.

1. Selector Switches

   Selector switches shall be for use on 120 volt control circuits. Contacts shall have a continuous current rating of 10 amperes both inductive and resistive. Selector switches shall be of the heavy duty oil tight type. Allen Bradley, Bulletin 800T, 800H, or equal.

2. Indicating Lights

   Indicating lights shall be push-to-test oil tight type. Units shall have LED lamps and shall be of the illuminated pushbutton type with the pushbutton wired for the push-to-test function required. Appropriate LED and lens color shall be provided as shown. Allen Bradley, Bulletin 800T, 800H, or equal.

3. Control Relays

   Relays for general purpose use shall be DPDT, 5 ampere minimum contacts with the appropriate coil voltage for the application. They shall have an 8-pin base, matching socket, and contact status indicator. All relays shall include MOV snubbers (for AC) or diodes (for DC) applied across the relay coils to reduce the surge caused by coil breakdown transients. Relays shall be Idec RH2B-ULD, or equal.

4. Terminal Blocks

   Terminal blocks shall be 600 volt modular terminal blocks with tubular screw and pressure plate. Provide a minimum of 20% or four whichever is greater, spare terminals in each panel. Allen-Bradley #1492-CA1, or equal.

2.3 PROGRAMMABLE LOGIC CONTROLLER AND SUPPORT COMPONENTS

A. Programmable Logic Controller

1. The programmable controller will be an existing Allen Bradley ControlLogix PLC, and will be programmed by the City's programmer for the automatic pump control logic.
2. Provide new 16 point digital input expansion module, Allen Bradley #1769-IQ16. Install module and associated wiring and terminals in existing panel. Coordinate with programmer for installation.

B. Operator interface:

1. The operator interface unit shall be a color touch panel with Ethernet communications.
2. Operator interface shall run Windows CE 6.0 operating system and shall provide for real time monitoring of the terminal displays from a web browser.
3. Provide all required cables and pre-loaded development software and licenses for a complete and operational system.
4. Manufacturer: Allen-Bradley Panelview Plus 6 700.

C. DC Power Supply with Uninterruptible Power Supply (UPS)

1. A complete 24V DC Power Supply and DC UPS system shall be provided for the new electrical panel. The DC power system shall be intended for industrial applications as manufactured by Allen Bradley, or equal.

D. Programming of PLC and Operator Interface

1. The PLC and operator interface shall be programmed by the City's programmer to provide the screens and functionality described in these specifications.
2. The System Integrator shall provide field technicians to assist with the startup and functional checkout of the complete control system.
3. Programming Software:
   a. PLC and operator interface programming and programming software required for the project will be provided by the City's programmer.

E. Seal Fail and Thermal Relays

1. Pump seal fail and thermal relays shall be installed for each pump in the system. The relay shall be capable of connecting to a seal failure probe and thermal contacts in the pump housing, and shall have output contacts to energize external indicator lights.
2. It is the responsibility of the pump System Integrator to select and coordinate the relays with the pump equipment provider for compatibility.

3. Relays shall be Mini-CAS II, or engineer and manufacturer approved equal.

F. Circuit Breakers

1. Circuit breakers other than those mounted in the panelboard shall be capable of being padlocked in the open position.

2. Thermal Magnetic: Circuit breakers shall be molded case thermal-magnetic type. Circuit breakers shall be quick-make and quick-break type. They shall have wiping type contacts. Each shall be provided with arc chutes, individual trip mechanisms on each pole. Two and three pole breakers shall be common trip. All breakers shall be calibrated for operation in an ambient temperature of 40oC. Molded case circuit breakers shall be trip-free. Each breaker shall have separate trip indication independent of the ON or OFF positions.

G. Load Center

1. Panelboard(s) or load center(s) shall be provided for power distribution, where shown on the drawings.

2.4 INSTRUMENTATION

A. FLOAT SWITCH

1. Switch shall be free floating, direct acting float switch designed for operation in raw sewage.

2. Mounting hardware shall include fixed installation on a 1" pipe, or suspended with a Kellems cord grip/strain relief and a weighted stainless steel support cable.

3. The float cable shall be a PVC coated multicore connecting cable which also contains the conductors, and shall be UL listed.

4. Float shall contain a mercury switch with a minimum rating of 4 amps at 120 Volts.

5. Float shall be foam-filled, hermetically sealed and polypropylene coated.

6. Floats shall be supplied with cable of sufficient length to reach the junction box without splices.

7. Intermediate relays and intrinsic safety barriers shall be provided for all wet well instrumentation in accordance with NFPA 820 and NEC article 500

8. Level switches shall be Flygt model ENM-10 with cable mounting kit and all required accessories, or equal.

B. SUBMERSIBLE LEVEL TRANSDUCER

1. The level sensor shall be a submersible pressure transducer designed for raw waste water applications. It shall utilize a piezoresistive silicon strain gauge transduction principle with an accuracy of +- 0.25%. The sensor housing and internal components shall be titanium, and the diaphragm shall be Teflon coated rubber.

2. The sensor shall be selected to provide sensing over the full range of levels in the wet well for the application.

3. The sensor shall include a PVC support structure, stainless steel mounting hardware, and all manufacturer recommended hardware for mounting in the wet well.

4. The sensor shall be FM approved for installation in Class 1, Div I Hazardous areas, and shall include an Intrinsic Safety Barrier in the Pump Control Panel, and include a 2-wire 4-20ma output compatible with 9-32Vdc excitation.

5. Level Sensor shall be KPSI Esterline model 750, or Engineer approved equal.

C. ELECTROMAGNETIC FLOW METER

1. Provide and install the magnetic flow meters as shown on the Contract Drawings and specified herein. The flow meters shall be complete with all necessary accessories and hardware for a complete and workable installation.

2. General: The magnetic flow meters shall be of the low frequency and short form coil design. The field principle of electromagnetic induction shall produce a positive DC pulsed signal directly and linearly proportional to the liquid flow rate. The metering tube shall be constructed of carbon steel with ANSI flanged end connections. Electrodes can either be protruding (bullet nose), but shall be of 316 stainless steel, Hastelloy®, or zirconium construction. The material of construction of the liner shall be TEFLON or PTFE. The meter shall secure its power from the signal converter. The systems shall have a power consumption of no more than 20 watts each. No electronics shall be mounted in the metering tube of the magnetic flow meter.

3. The signal converters shall be integral to the flow head. Signal converters shall provide a precisely adjusted direct current at a keyed pulse frequency of 15 Hz per second to the primary field coil. The signal converters shall convert the output signal from the flow meters into a 4-20 mA signal directly proportional to flow rate. The signal converters shall have automatic zero correction. The accuracy shall be ±.5 percent of the actual flow rate. The signal converters shall transmit an isolated analog 4-20 mA D-C signal, directly proportional to flow and a totalizer contact for remote flow totalization. The signal converters shall be designed to operate from a 120 AC, 60 Hz, single phase, power source. The signal converters shall generate power for the magmeter.

4. The units shall be labeled and listed by a recognized electrical testing laboratory for the application, or Approved by the Washington State Department of Labor and Industries for installation on the Project.

5. Each meter system shall be wet-calibrated at the manufacturer's facility against the master system. A calibration certificate shall be furnished for each meter. Provide grounding rings with each flow meter. The flow meter shall be capable of accidental submergence to 30 feet for a period of 24 hours.

6. The system shall be FM approved for installation in Class 1, Div 2 Hazardous areas.

7. The magnetic flow meters and signal converters shall be Siemens MagFlo with the following minimum components:

   a. Mag 5000 Transmitter, Remote Mount.

   b. Mag 5100W Mag Flow Meter.

   c. Standard Coil Cable.

   d. Standard Electrode Cable.

   e. Remote Mount Wall Bracket.

   f. Submersible Kit.

2.5 SPARE PARTS

A. In addition to spare parts mentioned elsewhere in this section, the Contractor shall supply the following spare parts:

1. 100% spare lamps of each type used for indicating lights.

2. One spare control relay of each type used, or 20% whichever is the greater number.

3. One spare lens of each color used for indicating lights.

4. Two spare fuses for each fuse provided under 10 amperes and one spare fuse for each fuse provided over 10 amperes.

5. 2 spare float switches for each type used.

PART 3 - EXECUTION

3.1 GENERAL

A. Install materials and equipment in a workman-like manner utilizing craftsmen skilled in the particular trade. Provide work which has a neat and finished appearance.

B. Coordinate Instrumentation and Control work with the System Integrator, Owner, Contractor and work of other trades to avoid conflicts, errors, delays and unnecessary interference with system operations during construction.

3.2 COORDINATION WITH SYSTEM INTEGRATOR

A. The Contractor shall coordinate directly with the System Integrator to ensure all requirements within the scope of this Section are satisfied.

B. System Simulation

1. To the degree possible, the entire control system shall be simulated at the System Integrator's facility. The Engineer, Contractor and Owner personnel shall be invited to witness simulation and approve test results prior to shipment to Contractor.

C. Field Acceptance Test

1. The System Integrator shall conduct acceptance tests and provide operator training for the complete and functional control system.

3.3 PROTECTION DURING CONSTRUCTION

A. The Contractor shall provide protection for materials and equipment against loss or damage and the effects of weather. Prior to installation, store items in an indoor, dry location. Provide heating in storage areas for items subject to corrosion under damp conditions. Specific storage requirements shall be in accordance with the manufacturer's recommendations.

3.4 MATERIAL AND EQUIPMENT INSTALLATION

A. Follow manufacturer's installation requirements, unless otherwise indicated. Wherever any conflict arises between manufacturer's instructions and these Contract Documents, follow Engineer's decision, at no additional cost to the Owner. Maintain a copy of manufacturer's installation instructions on the jobsite at all times.

3.5 COORDINATION FOR AUTOMATIC CONTROL AND MONITORING

A. The System Integrator and Contractor shall coordinate with the City’s programmer, L2 Systems, to verify all programming and functional testing for the PLC, operator interface, telemetry and control system, and place the complete system into operation.

B. The automatic control and monitoring features and operational requirements shall be coordinated between the City, L2 Systems, System Integrator and Contractor.

C. The System Integrator and Contractor shall provide all required work for a complete and functional control system. Field adjustments or additional features added during startup and commissioning shall be included in the bid price.

D. All final programs shall become the property of the City and shall be provided on CD with full access rights.

END OF SECTION 16925

APPENDIX A –

GEOTECHNICAL REPORT

GEOTEST

741 Marine Drive
Bellingham, WA 98225

20611-67th Avenue NE
Arlington, WA 98223

PHONE
360 733_7318

TOLL FREE
888 251_5276

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360 733_7418

June 19, 2013
Project No. 13-0310

Wilson Engineering, LLC
805 Dupont Street, Suite 7
Bellingham, Washington 98225

Attn.: Mr. Jeff Christner, P.E.

Re: Limited Geotechnical Engineering Evaluation
Ferndale Pump Station #4 Improvements
1670 West Smith Road
Ferndale, Washington

Dear Mr. Christner:

As requested, GeoTest Services, Inc. (GTS) is pleased to submit this report summarizing the results of our limited geotechnical evaluation for the proposed improvements to the existing Pump Station #4 facility, located at 1670 West Smith Road in Ferndale, Washington (see Vicinity Map, Figure 1). This report has been prepared in general accordance with the terms and conditions established in our services agreement, dated May 31, 2013.

PURPOSE AND SCOPE OF SERVICES

The purpose of this evaluation is to establish general subsurface conditions beneath the site from which conclusions and recommendations pertaining to project design could be formulated. Specifically, our scope of services includes the following tasks:

- Exploration of soil and groundwater conditions underlying the site by advancing 1 exploration boring with a subcontracted drill rig to evaluate subsurface conditions.

- Provide this written report containing a description of subsurface conditions, exploration logs, findings and recommendations pertaining to site preparation and earthwork, fill and compaction, wet weather earthwork, seismic design considerations, and construction monitoring.

PROJECT DESCRIPTION

The site consists of an existing City of Ferndale Pump Station with two existing below grade wet wells and an on-site generator. GTS has received a preliminary plan sheet of the proposed improvements and understands that site development will include a new 8-foot diameter, pre-cast concrete wet well that will be installed approximately 22 feet below existing site grades. Preliminary construction plans were prepared by Wilson Engineering and provided to us for review. We also understand that minor grading will be performed in the vicinity of the new wet well.

SITE CONDITIONS

This section discusses the general surface and subsurface conditions observed at the project site during the time of our field investigation. Interpretations of the site conditions are based upon the results of our review of available information, site reconnaissance, subsurface exploration, laboratory testing, and our experience in the project vicinity.

Surface Conditions

The proposed development area is located at 1670 West Smith Road in Ferndale, Washington. West Smith Road borders the property to the south and Labounty Drive is to the east. No other buildings or facilities are in the immediate vicinity of the proposed improvements. The site contains a small access drive connecting West Smith Road to the pump station facility. The site currently supports 2 below-grade wet wells and has a on-site generator. Construction fencing surrounds the wells and the generator.

The majority of the site is relatively flat, with only a few feet of elevation differential across the property. It should be noted, however, that a prism of fill exists in the central portion of the property and elevates the pump station facility approximately 4 feet above adjacent grades. Surface grades have largely been covered with gravel surfacing and native vegetation has been removed from the site.

Subsurface Soil Conditions

Subsurface conditions were explored by advancing 1 exploration boring (B-1) on June 1, 2013. The exploration was advanced to a depth of about 32.5 feet below existing site grades using a subcontracted drill rig. The subsurface soils generally consisted of about 7 feet of fill material overlying soft to medium stiff slightly gravelly sandy silt which was interpreted to be representative of Bellingham Drift. See the attached Site and Exploration Map (Figure 2) for the approximate locations of the exploration boring.

General Geologic Conditions

Geologic information for the project site was obtained from the interactive *Geologic Map of Washington State*, published by the Washington State Department of Natural Resources (DNR). According to the DNR map, general geologic conditions in the vicinity of the site consist of Bellingham Drift. Bellingham Drift is typically a blue-gray, unsorted, unstratified pebbly, sandy silt and pebbly clay. Per the soil map, Bellingham Drift is derived from rock debris melted out of floating ice and deposited on sea floor. Bellingham drift typically mantles upland areas between flood plains below elevations of 600 feet.

In general, our on-site explorations indicate that the encountered subsurface soil conditions are similar to the mapped regional deposits in the vicinity of the project site.

Groundwater

Groundwater seepage was encountered at a depth of about 12 feet below existing site grades during drilling activities. The groundwater conditions reported on the exploration log is for the specific location and date indicated, and therefore may not necessarily be indicative of other locations and/or times. Groundwater levels are not static and groundwater conditions will vary depending on local subsurface conditions, precipitation, changes in site use, both on and off site, and other factors.

CONCLUSIONS AND RECOMMENDATIONS

It is our opinion that subsurface conditions at the site are suitable for the support of the proposed wet well provided the recommendations contained herein are incorporated into the project design. GTS encountered an approximately 7 foot thick section of previously placed fill underlain by soft to medium stiff sandy silt. In our opinion, these soils are suitable for the support of the planned wet well provided appropriate care is taken during excavations to not disturb the bottom of the excavation. It is assumed that installation of the wet well will require excavating down to the planned depth of the well in conjunction with appropriate shoring and dewatering measures. The contractor is responsible for submitting all shoring and dewatering plans before the start of construction to the governing municipality for review. It is anticipated that the wet well will be set upon a 24-inch pre-cast base underlain by at least 12 inches of Class A Gravel Base for Foundation Backfill per WSDOT Specification 9-03.12(1)A per the preliminary plans provided by Wilson Engineering.

The underlying Bellingham Drift is not considered suitable for reuse as structural fill materials due to elevated moisture and silt contents. The native soils are, however, suitable for reuse as non-structural fill and may be used to raise grade for those areas on site that do not support structural loads. During the wet winter and spring months, the contractor and owner should be prepared to manage over-optimum moisture content soils and subgrade conditions. If feasible, construction should occur during extended periods of dry weather.

Site Preparation and Earthwork

The portions of the site to be occupied by the proposed wet well should be prepared by removing any existing topsoil, pavement sections, deleterious material or other unsuitable materials in the vicinity of the planned excavation.

Subgrade soils should be observed by qualified geotechnical personnel. Subrade soils with significant deflections or pumping should be overexcavated to firm soil. Overexcavated areas should be backfilled with structural fill as recommended elsewhere in this report.

Excavation Considerations

The depth of the well suggests that a 22 to 25 foot deep excavation will be required to install the well. Portions of the well excavation will be below the groundwater table and there is a potential that excavations below the ground water table could experience a “quick” condition. A quick condition develops when the seepage pressure exceeds the resisting pressure. In this case, it would be the upwards vertical flow of water exceeding the unit weight of the soils at the bottom of the excavation. The potential for a quick condition to develop is based on the hydraulic head difference between the water table level and the bottom of the excavation, as well as the unit weight of the surrounding soils. We encountered groundwater conditions at approximately 12

feet below existing site grades. Based on the plans provided to us, the ground water elevation will be higher than the base of the excavation. The probability of a quick condition developing decreases as the elevation differential between groundwater levels and the bottom of the excavation decreases.

If a quick condition does develop within the excavation, it will be necessary to add 2 to 4 inch quarry spall rock to the bottom of the excavation during the excavation process. The quarry spall rock will add weight to the saturated soils and provide resistance against hydrostatic forces. If quick conditions develop in a lateral direction, mitigating the differential forces will be more difficult and will likely require that the water table be lowered to below the depth of the excavation.

Dewatering

Based on our experience, it is likely that ground water will be controlled by using sump pumps during the well excavation or through the use of well points placed around the well. GTS recommends that the Contractor plan for and anticipate the presence of groundwater and make provisions to address wet to saturated soils during excavations. It is the Contractor's responsibility to provide a suitable dewatering plan based on the type and depth of the excavation and the ground water elevation during construction.

Temporary Shoring

It is assumed that construction sequencing will consist of excavation of the wet well using a large excavator, placing a trench box or similar temporary shoring within the excavation, and placement of the gravel base, pre-cast base, and concrete rings that will form the well. If alternative construction techniques are used, GTS should be allowed to review the construction plan and, if necessary, make revisions to our recommendations. It is assumed that the contractor will anticipate and be prepared to dewater the excavation and address the potential for quick conditions during excavations.

The trench box used during the construction process should be structurally certified and the contractor must have experience excavating in wet to saturated subgrade conditions. We anticipate that soils to be encountered during the excavation process will provide low to moderate resistance to digging. As previously stated, the potential exists for the loss of soil support during construction due to the elevated groundwater table. Laborers within the excavation must remain within the trench box at all times. Temporary shoring and construction activities must conform to applicable OSHA/WISHA guidelines and is the responsibility of the contractor.

Fill and Compaction

Structural fill must be properly placed and compacted. In general, non-organic, predominantly granular soil may be used as structural fill provided the material is properly moisture conditioned prior to placement and compacted to at least 95 percent of the maximum dry density, as determined using test method ASTM D1557. Material containing topsoil, wood, trash, organic material, or construction debris will not be suitable for reuse as structural fill and should be properly disposed offsite or placed in nonstructural areas.

Soils containing more than approximately 5 percent fines are considered moisture sensitive. These soils are very difficult to compact to a firm and unyielding condition when over the optimum moisture content by more than approximately 2 percent. The optimum moisture content is that which allows the greatest dry density to be achieved at a given level of compactive effort.

Reuse of On-Site Soil

It is our opinion that the predominantly granular sandy silts (Bellingham Drift) are not suitable for reuse as structural fill materials due to the elevated moisture and silt content of the soil. It is GTS's opinion, however, that the native soils are suitable for re-use as fill in non-structural areas and when placed at or near optimum moisture contents as determined by ASTM D1557. If the on-site soils are used as non-structural fill, the contractor should be prepared to address over-optimum moisture content soils.

Imported Structural Fill

We recommend that imported structural fill consist of clean, well-graded sandy gravel, gravelly sand, or other approved naturally occurring granular material (pit run) with at least 40 percent retained on the No. 4 sieve, or a well-graded crushed rock. Structural fill for dry weather construction may contain on the order of 10 percent fines (that portion passing the U.S. No. 200 sieve) based on the portion passing the U.S. No. 4 sieve.

Accordingly, we recommend that imported structural fill with less than 5 percent fines be used during wet weather conditions. Due to wet weather or wet site conditions, soil moisture contents could be high enough that it may be very difficult to compact even "clean" imported select granular fill to a firm and unyielding condition. Soils with over-optimum moisture contents should be scarified and dried back to more suitable moisture contents during periods of dry weather or removed and replaced with drier structural fill.

Compaction of Structural Fill

Structural fill should be placed in horizontal lifts 8 to 10 inches in loose thickness and thoroughly compacted. All structural fill placed under load bearing areas should be compacted to at least 95 percent of the maximum dry density, as determined using test method ASTM D1557. We recommend that compaction be tested after placement of each lift in the fill pad.

Fill Alternative - Controlled Density Fill

If the placement of the wet well in the excavation does not leave sufficient room to adequately compact backfill around the well, GTS recommends utilizing a flowable mix of controlled density fill (CDF) for backfill. CDF consists of a mixture of water, sand, fly ash, and cement that will flow laterally to fill voids and backfill around the structure. GTS recommends the use of a maximum 100 pounds per square inch (psi) compressive strength CDF mix to facilitate future excavation and provide a performance equivalent to well-compacted soil backfill.

Wet Weather Earthwork

It is our experience that fine grained native soils are particularly susceptible to degradation during wet weather. As a result, it may be difficult to control the moisture content of the site soils during the wet season. If construction is accomplished during wet weather, we

recommend that structural fill consist of imported, clean, well-graded sand or sand and gravel as described above. If fill is to be placed or earthwork is to be performed in wet weather or under wet conditions, the contractor may reduce soil disturbance by:

- Limiting the size of areas that are stripped of topsoil and left exposed
- Accomplishing earthwork in small sections
- Limiting construction traffic over unprotected soil
- Sloping excavated surfaces to promote runoff
- Limiting the size and type of construction equipment used
- Providing gravel "working mats" over areas of prepared subgrade
- Removing wet surficial soil prior to commencing fill placement each day
- Sealing the exposed ground surface by rolling with a smooth drum compactor or rubber-tired roller at the end of each working day
- Providing up-gradient perimeter ditches or low earthen berms and using temporary sumps to collect runoff and prevent water from ponding and damaging exposed subgrades

Seismic Design Considerations

The Pacific Northwest is seismically active and the site could be subject to ground shaking from a moderate to major earthquake. Consequently, moderate levels of earthquake shaking should be anticipated during the design life of the project, and the proposed structure should be designed to resist earthquake loading using appropriate design methodology.

For structures designed using the seismic design provisions of the 2009 International Building Code, the soft to medium stiff Bellingham Drift interpreted to underlie the site within the upper 100 feet classifies as Site Class E, according to Site Class Definitions, Table 1613.5.2. The corresponding values for calculating a design response spectrum for the assumed soil profile type is considered appropriate for the site.

Please reference the following values for seismic structural design purposes:

Conterminous 48 States – 2009 International Building Code
Zip Code 98248
Central Latitude = 48.833819, Central Longitude = -122.569675

Short Period (0.2 sec) Spectral Acceleration

Maximum Considered Earthquake (MCE) Value of S_s = 0.977 (g)
Site Response Coefficient, F_a = 0.927 (Site Class E)
Adjusted spectral response acceleration for Site Class E, $S_{MS} = S_s \times F_a$ = 0.906 (g)
Design spectral response acceleration for Site Class E, S_{DS} = 2/3 x SM_s = 0.604 (g)

One Second Period (1 sec) Spectral Acceleration

Maximum Considered Earthquake (MCE) Value of S_1 = 0.326 (g)
Site Response Coefficient, F_v = 2.695 (Site Class E)
Adjusted spectral response acceleration for Site Class E, $S_{M1} = S_1 \times F_v$ = 0.879 (g)
Design spectral response acceleration for Site Class E, S_{D1} = 2/3 x SM_1 = 0.586 (g)

Base Slab Support

GTS recommends that the base slab be constructed in general accordance with the manufacturer's recommendations. Base slabs should not be founded on topsoil, existing fill, or soft native soils. Prior to placement of the base slab, a representative of GTS should view the subgrade soils and confirm the presence of firm and unyielding subgrade soils. In areas where soft or unsuitable soils are present below the base, these soils should be removed to expose firm and unyielding native soil. In areas where excavations to firm and unyielding soils are impractical, the bottom of the excavation may be over-dug and 2 to 4 inch diameter quarry spalls may be placed to provide a firm, workable base at the bottom of the excavation.

Per the preliminary construction plans provided by Wilson Engineering, base slabs shall be underlain by a minimum of 12 inches of compacted Gravel Base for Foundation Backfill per WSDOT Specification 9-03.12(1)A. Gravel Base fill should be compacted to 95 percent of ASTM D1557. The purpose of this layer is to provide uniform support for the base slab.

The lower half of the well will be below the ground water table. Appropriate waterproofing measures may be considered if the intrusion of groundwater into the well is a concern.

Resistance to Lateral Loads

The lateral earth pressures that develop against buried structures will depend on the method of backfill placement, degree of compaction, type of backfill material, provisions for drainage, magnitude and location of adjacent surcharge loads, and the degree to which the walls of the below grade structure can yield laterally during or after placement of backfill. It is assumed that the well will be restrained against lateral movement or tilting and that the resulting lateral pressures will be considered as an "at-rest".

We recommend that the upper portion of the buried well be designed for an "at rest" equivalent fluid density of 65 pounds per cubic ft (pcf) for structural fill and assumes drained conditions. For those portions of the well below the water table, we recommend an "at rest" equivalent fluid density of 25 pounds per cubic foot for soil. This value does not include the lateral pressure of free water acting on the below grade structure. The design of the well should include appropriate lateral pressures caused by surcharge loads at the surface.

Site Drainage

Positive surface gradients should be provided adjacent to the proposed structures to direct surface water away from the well and toward suitable drainage facilities. Surface water should not be allowed to pond and soak into the ground surface near above ground structures during or after construction. Construction excavations should be sloped to drain to sumps where water from seepage, rainfall, and runoff can be collected and pumped to a suitable discharge facility.

The placement of the well below grade does not allow for a drain system to be placed around the structure to prevent the accumulation of buoyant forces. As such, below-grade structures must be designed to resist buoyant forces by combining the dead weight of the structure with soil friction acting on the buried portion of the structure.

Geotechnical Consultation and Construction Monitoring

GeoTest Services recommends that we be involved in the project design review process. The purpose of the review is to verify that the recommendations presented in this report have been properly interpreted and incorporated in the plans and specifications for this project.

We recommend that geotechnical construction monitoring services be provided. These services should include observation by GeoTest personnel during subgrade preparation operations, structural fill placement, and to confirm that design subgrade conditions are obtained beneath the proposed well. We also recommend that periodic field density testing be performed, as required, to verify that the appropriate degree of compaction is obtained. The purpose of these services would be to observe compliance with the design concepts, specifications, and recommendations of this report. In the event that subsurface conditions differ from those anticipated before the start of construction, GeoTest Services would be pleased to provide revised recommendations appropriate to the conditions revealed during construction.

GeoTest is also available to provide a full range of materials testing and special inspection during construction as required by the local building department and the International Building Code. This may include specific construction inspections on materials such as reinforced concrete, reinforced masonry, wood framing and structural steel. These services are supported by our fully accredited materials testing laboratory.

USE OF THIS REPORT

GeoTest Services has prepared this report for the exclusive use of Wilson Engineering, LLC and their design consultants for specific application to the design of the proposed wet well located at 1670 West Smith Road in Ferndale, Washington. Use of this report by others is at the user's sole risk. This report is not applicable to other sites. Our services have been conducted in accordance with generally accepted practices of the geotechnical engineering profession; no other warranty, express or implied, is made as to the professional advice included in this report.

Our site explorations indicate subsurface conditions at the dates and locations indicated. It is not warranted that they are representative of subsurface conditions at other locations and times. The analyses, conclusions, and recommendations contained in this report are based on site conditions to the limited depth of our explorations at the time of our exploration program, a geological reconnaissance of the area, and a review of previously published geological information for the site. If variations in subsurface conditions are encountered during construction that differs from those in this report, we should be allowed to review the recommendations contained in this report and, if necessary, make revisions. If there is a substantial lapse of time between submission of this report and the start of construction, or if conditions change due to construction operations at or adjacent to the project site, we recommend that we review this report to determine the applicability of the conclusions and recommendations contained herein.

The earthwork contractor is responsible to perform all work in conformance with all applicable WISHA/OSHA regulations. GeoTest Services, Inc. should not be assumed to be responsible for job site safety on this project, and this responsibility is specifically disclaimed.

We appreciate the opportunity to provide geotechnical services on this project and look forward to assisting you during the construction phase. If you have any questions regarding the information contained in this report, or if we may be of further service, please contact the undersigned.

Respectfully Submitted,
GeoTest Services, Inc.

6/19/13

Dong-Soo Lee, P.E.
Sr. Geotechnical Engineer

6-19-13

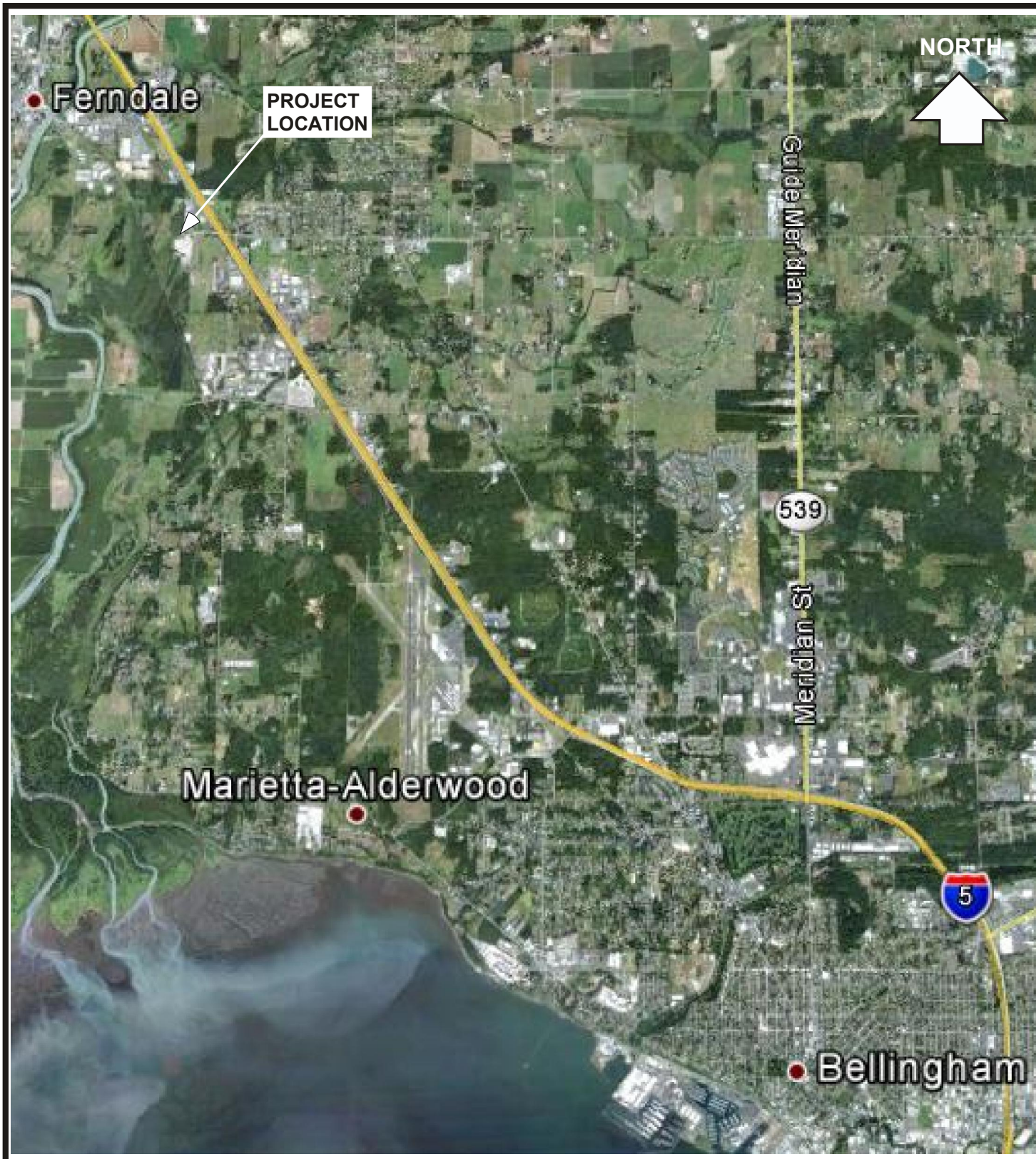
Edwardo Garcia, P.E.
Project Geotechnical Engineer

Attachments:

	Figure 1	Vicinity Map
	Figure 2	Site and Exploration Plan
	Figure 3	Soil Classification System and Key
	Figure 4	Exploration Boring Log
	Figure 5	Laboratory Testing

REFERENCES

Interactive Geologic Map of Washington State. Online interactive services provided by the Washington State Department of Natural Resources.



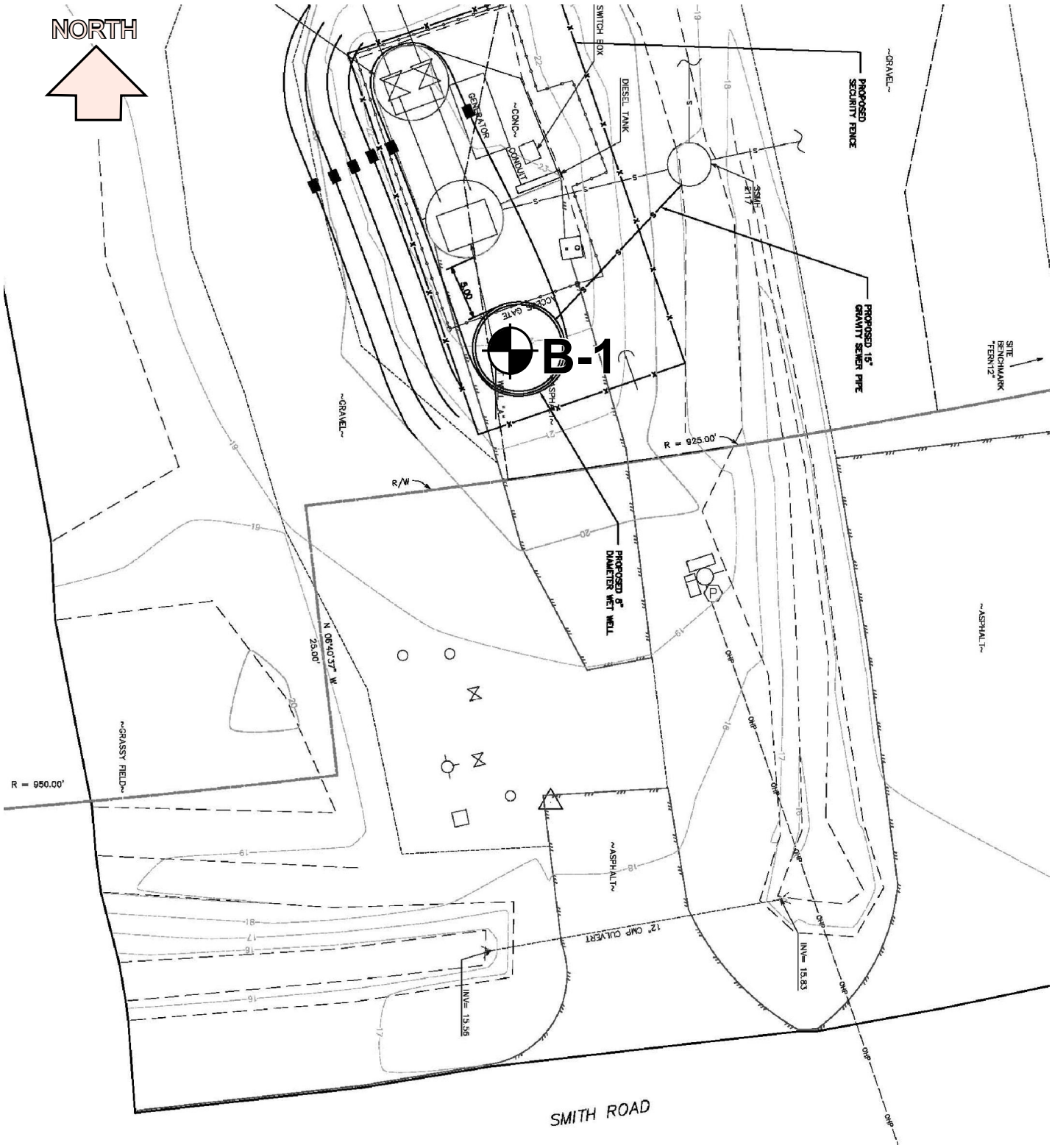
Reference Map Provided By Google Earth

GEOTEST SERVICES, INC.
741 Marine Drive
Bellingham, WA 98225
phone: (360) 733-7318
fax: (360) 733-7418

Date: 06-10-13	By: EG	Scale: NONE	Project 13-0310

VICINITY MAP
PUMP STATION #4 IMPROVEMENTS
1670 W. SMITH ROAD
FERNDALE, WASHINGTON

FIGURE 1



GEOTEST SERVICES, INC. 741 Marine Drive Bellingham, WA 98225 phone: (360) 733-7318 fax: (360) 733-7418	Date: 6-10-13	By: EG	Scale: As Noted	Project **13-0310**
	SITE AND EXPLORATION PLAN **PUMP STATION #4 IMPROVEMENTS** **1670 W. SMITH ROAD** **FERNDALE, WASHINGTON**			Figure 2

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL	TYPICAL DESCRIPTIONS[1][2]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

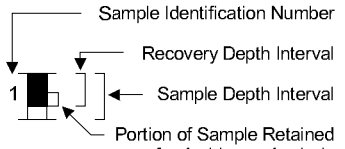
OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. Soil descriptions are based on the general approach presented in the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*, as outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the *Standard Test Method for Classification of Soils for Engineering Purposes*, as outlined in ASTM D 2487.
2. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent:	> 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
	> 12% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and ≤ 12% - "slightly gravelly," "slightly sandy," "slightly silty," etc.
	≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key

SAMPLE NUMBER & INTERVAL



SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	*Pushed*
4	Other - See text if applicable

Groundwater

▽ ATD — Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

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Pump Station #4 Improvements Ferndale, WA

Soil Classification System and Key

Figure 3

B-1

Drilling Method: Hollow-stem Auger
Ground Elevation (ft): 23
Drilled By: Bortec Inc.

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Soil Profile	Water Level
0						GP	Medium dense to dense, moist, brown, sandy gravel, trace to slighlty silty. (Gravel Fill)	
						SM	Loose to medium dense, moist, brown, gravelly silty sand. (Fill)	
5	S-1	b2	8	W = 19				
						ML	Soft to medium stiff, blue/gray, moist, slightly gravelly, sandy silt. (Bellingham Drift)	
10	S-2	b2	13	W = 16 GS		SM/ ML	grades to gray/tan, very sandy silt, slightly clayey/very silty sand, slighlty clayey, trace gravel	▽ ATD
15	S-3	b2	4	W = 24				
20	S-4	b2	3	W = 22		ML	grades to gray, sandy silt, trace gravel	
25	S-5	b2	4	W = 20 GS				
30	S-6	b2	4	W = 22				
	S-7	c3						
35							Boring Completed 06/07/13 Total Depth of Boring = 33.5 ft.	

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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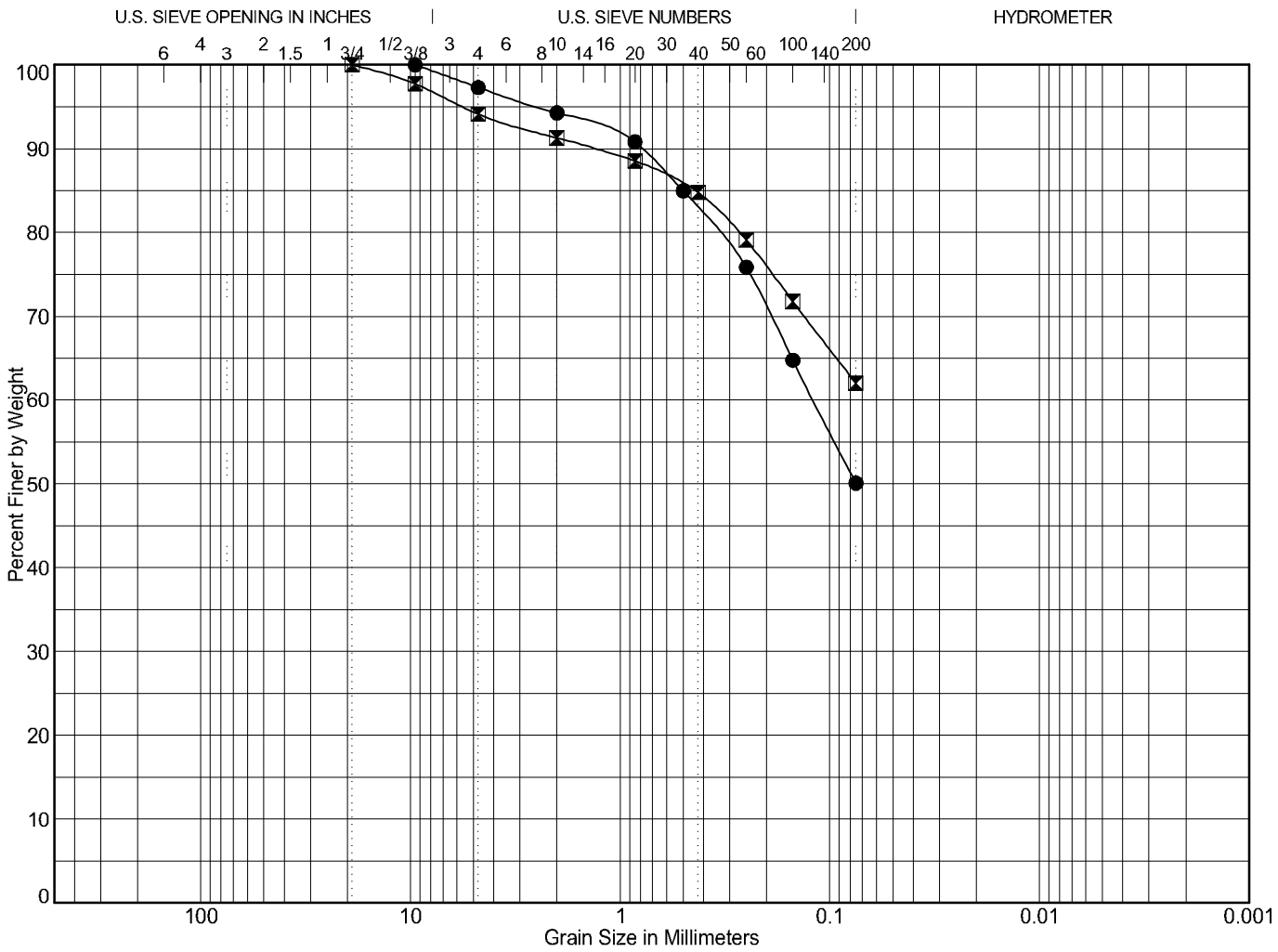
Pump Station #4 Improvements Ferndale, WA

Log of Boring B-1

Figure 4



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Point		Depth	Classification	LL	PL	PI	C_c	C_u
●	B-1	10.0	Very sandy silt, trace gravel/Very silty sand, trace gravel (SM/ML)					
⧓	B-1	25.0	Sandy silt, trace gravel (ML)					

Point		Depth	D_{100}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
●	B-1	10.0	9.5	0.12				0.0	2.7	3.0	11.4	32.7	50.1
⧓	B-1	25.0	19					0.0	5.9	2.8	6.5	22.8	62.0

$C_c = D_{30}^2/(D_{60} * D_{10})$

$C_u = D_{60}/D_{10}$

To be well graded: $1 < C_c < 3$ and $C_u > 4$ for GW or $C_u > 6$ for SW

GEOTEST

Pump Station #4 Improvements Ferndale, WA

Grain Size Test Data

Figure 5

APPENDIX B –

STATE PREVAILING WAGE RATES

APPENDIX B –

STATE PREVAILING WAGE RATES

The State of Washington prevailing wage rates applicable for this public works project, which is located in Whatcom County, may be found at the following website address of the Department of Labor and Industries:

https://fortress.wa.gov/lni/wagelookup/prvwagelookup.aspx

Based on the bid submittal deadline for this project, the applicable effective date for prevailing wages for this project is May 7, 2015. A copy of the applicable prevailing wage rates are also available for viewing at the office of the Owner, located at:

City of Ferndale 2095 Main Street, Ferndale, WA 98248

Upon request, the Owner will mail a hard copy of the applicable prevailing wages for this project.