City of Coos Bay
Request for Proposals
To Provide Bidding and Construction
Management Services for Pump Station 4

NOTICE

The City of Coos Bay is accepting Proposals to provide bidding and construction management services for the Pump Station 4 project. The City invites qualified consultants to submit a proposal package based upon the scope of work contained within this Request for Proposals (RFP). This project is fully funded by Lottery funds through Water Wastewater Financing Program administered by Oregon Business Development Department – Infrastructure Finance Authority in conjunction with the project titled, *Coos Bay Initial Wastewater System Repairs Design & Construction*

SUBMISSION OF PROPOSAL PACKAGE

To receive consideration, proposal packages must be submitted in accordance with the following instructions:

1. All proposal packages shall be delivered to:

   City of Coos Bay
   Public Works & Development Department
   Attn: Jennifer Wirsing
   500 Central Avenue
   Coos Bay, OR 97420

2. Submit six (6) copies of the proposal by 3:00 p.m. on February 1, 2013.

3. The proposals must be clearly marked "PROPOSAL FOR BIDDING AND CONSTRUCTION MANAGEMENT SERVICES FOR PUMP STATION 4".

4. Maintaining the integrity of the RFP process is extremely important to the City of Coos Bay. As such all questions, shall be directed to the project manager, Jennifer Wirsing, at (541) 269-1181 ext. 2247 or email jwirsing@coosbay.org. Prior to contact, please review the General Information regarding Additional Information Requests, located on Page 8 of this packet. Answers to all questions will be posted on line and made available to all firms intending to submit a package. Failure to adhere to these restrictions may significantly reduce your prospects for selection.

5. The City of Coos Bay reserves the right to reject any and all proposals, and has the right, at its sole discretion, to accept the proposal it considers most favorable to the City's interest and the right to waive minor irregularities in procedures.

CITY OF COOS BAY
INSTRUCTIONS TO SUBMITTERS
FOR BIDDING AND CONSTRUCTION
MANAGEMENT SERVICES FOR PUMP STATION 4

GENERAL INSTRUCTIONS

The City of Coos Bay invites qualified individuals or firms to submit a proposal to provide municipal engineering services as described in the specifications set forth in this Request for Proposals (RFP). All submittals are subject to the provisions and requirements of the City of Coos Bay's Rules of Local Contract Review and the Oregon Revised Statutes, the Attorney General's Model Public Contract Rules.

RFP PACKAGE REQUIREMENTS

Your RFP package must not exceed ten (10) pages and at a minimum shall include the following:

1. **Cover Letter**. All RFP packages must include a cover letter, made to the attention of Jennifer Wirsing, Engineering Service Coordinator, and signed by a person legally authorized to bind the applicant to its Proposal. The cover letter shall include any potential conflicts of interest your firm or any key individuals may have with this project. Additionally, the cover letter must include the following items:

    a. the firm name,
    b. the names of local partners/principals and the number of local personnel,
    c. address, telephone, and FAX numbers of the firm,
    d. contact information, including an email address and phone number, of the person(s) who are authorized to represent the proposer.

2. **Personnel**. All RFP packages must include the following information related to key personnel who will be working on this project. Please note that the City's contract for professional services for this project will require commitment from the selected firm that the personnel listed below will be assigned to the project in the roles stated by your firm.

    a. The names of the partners, managers and other key staff persons who will be assigned to the project along with brief resumes that indicate their experience in municipal civil engineering, specifically wastewater engineering.
    b. Indicate the key staff's job classification, roles and responsibilities, professional registrations and certifications, and office location. Experience with design and construction administration of pump stations is a high priority.
    c. An organizational chart identifying members of the team, including sub consultants, who would be assigned to this project. The chart should clearly delineate roles and responsibilities of the various team members.
    d. For the proposed sub consultants, please provide the name of each firm, the office location, contact name and telephone number, and the services to be provided.

3. **References**. All RFP packages must include the following information related to the references and qualifications relative to the scope of work associated with this RFP.

    a. List of Oregon local government jurisdictions your firm is currently providing wastewater engineering services and construction management services for or has provided engineering services and/or construction management services for within the last 5 years.
    b. Relevant Project Summary/Profile Sheets completed within the last 5 years. At a minimum, the sheets shall provide a brief description of the project, provide date design was completed, total cost of design, provide date construction was completed (if applicable), and cost of construction (if applicable). Provide staff that was involved with the project. Provide owner information and contact person.
    c. Provide references for your team members, concentrating on those members who will have the largest degree of involvement on the project. Indicate the project involved and the individual's role. Provide contact information for the reference.

4. **Project Approach.** A preliminary scope of work has been included with this RFP, however it is anticipated that the proposal will include any amendments and/or provide additional recommendations based on their experience on similar projects. Describe how your team will meet the project goals and summarize why your firm should be selected.

5. **Fee.** The proposed fees shall include hourly estimates and rates by job description for services and related items listed in the Scope of Services and otherwise needed to assure complete execution of the Contract. The proposed fees shall be an hourly not-to-exceed amount. Any basis for an increase in the amount of compensation beyond this not-to-exceed amount shall be stated in the proposal. The project fee shall be included with the proposal in a sealed envelope. The envelope does not count towards the maximum page limit of 10 pages.

QUALIFICATION EVALUATION CRITERIA

The City will follow a selection procedure that involves the review of all qualified proposals, the evaluation and ranking of submittals, negotiation of fees with the most qualified firm and award of contract based upon our local and state procurement requirements. Final ranking will be based on the evaluation criteria. Price will be considered, but will not necessarily govern selection of the Consultant. The selection will be based on the following criteria:

QUALIFICATIONS

Are similar and current projects included to document the consultant's qualifications? Are individual staff members identified and has documentation been provided to ensure the Consultant has the staff to perform the work? Does consultant have appropriate management and support staff with the required experience for work on this type of project? Is staff local? Is staff located in Oregon? Is the staff identified in the proposal the same staff that performed the work on the projects submitted? Is the proposal clear, concise, and complete?

PROJECT STAFFING

Is the project manager qualified to manage all phases of the project? Has consultant demonstrated ability in studying and designing similar projects on time and within budget? Does support staff have sufficient experience with related work? Are all required disciplines represented in this scope of work? If sub consultants are proposed, have they worked with the consultant before? Have all team members had similar experience regarding project scope and magnitude? Does proposal show that staff is available to perform the work per schedule outlined in scope. Proposal must demonstrate that project manager has the ability to communicate with City Council and City Staff. Proposal must demonstrate performance history in meeting deadlines, submitting accurate estimates, producing quality work, and meeting financial obligations

PROJECT EXPERIENCE

Are similar and current projects submitted as examples? Does the reference confirm a "job well done"? Are references current and accessible? Does the City of Coos Bay have a positive experience with the consultant? Has the project team, which is presented in this package, worked successfully on past projects?

PROPOSED SERVICES

Is a clear understanding of the project stated and demonstrated throughout? Is the scope detailed and comprehensive? Is the scope consistent with the teaming and staffing levels?

PROPOSAL CONTENT

Does proposal present all required material in a clear and professional manner? Does proposal address all required information?

BACKGROUND AND SCOPE OF WORK

BACKGROUND

The City of Coos Bay is the largest community on the Oregon coast and provides wastewater collection, treatment, and disposal services to retail customers within the city limits. The topographic characteristics of the City are gentle low lying hills. As such, there is a ridgeline that divides the City into two primary basins for gravity collection, served by two wastewater treatment plants (WWTP). The City owns and operates both of these activated sludge wastewater treatment plants. Wastewater is conveyed to one of the two wastewater treatment plants using a combination of up to 23 sanitary sewer pump stations and a combined total of over 90 miles of sanitary collection system piping. Pump Statin 4 is tributary to WWTP 1.

Pump Station 4 is located immediately adjacent to Blossom Gulch School. The original station was constructed in 1954 and then rebuilt and relocated in 1973. The pump station has outlived its useful life span and has become a maintenance and performance issue for the City.

The existing pump station was constructed contiguous to the Blossom Gulch Creek, immediately upstream of S. 10th Street on the south bank of the creek. The creek laps against the side of the wetwell on the north side of the pump station structure. Blossom Gulch Creek is a salmonid bearing stream that is utilized as a minor hatchery part of the year. As such, the environmental concerns for this site are significant. Environmental permits were obtained for this project and included with this RFP for your reference. The City does not own the property where the new site is proposed. Therefore, two easements were obtained to allow construction of a new pump station and force main. The easements have also been included for your reference.

The plans and specifications are bid ready and approved by the Oregon Department of Environmental Quality. Copies of the contract documents are available on the City web site.

SCOPE OF WORK

Professional Engineering Services will include, but not be limited to, responding to pre-bid questions; presiding over the pre-bid conference and bid opening; construction surveying and stakeout; construction inspection; pay request review; preparation of a DEQ approved Operations and Maintenance Manual; project closeout activities; preparation of record drawings; and to serve as the Owner's professional representative with state governmental agencies. It is anticipated that the duration of this contract will not exceed 10 months. The duration is from commencement of the Bidding services to final project closeout, including DEQ approvals for the O&M Manual. The following is a more detailed list of scope of services:

1. BIDDING SERVICES
   a. Bid Coordination / Plans, Specifications and Contract Document Review
      Review project documentation, plans, and specifications. Attend meeting with City, engineer, and Oregon Infrastructure Finance Authority (herein referred to as "IFA") representatives.
   b. Pre-Bid Conference
      Maintain list of plan holders and bidders for the project and receive and answer all questions regarding the bid. Maintain a log of all bid questions and responses and make this information available as necessary.
   c. Pre-Bid Conference
      Coordinate and conduct a Pre-Bid Conference.
   d. Bid Opening and Award

Prepare a bid submittal checklist/tally list to record the competitive bids. Attend bid opening at City Hall. Review bids and provide City with a list of the preliminary results. Further review the bid information and provide City with detailed bid information for final bid tally sheet. All bidders' calculations shall be verified and any errors will be noted and documented.

2. CONSTRUCTION SERVICES
   a. Pre-Construction Conference
      Coordinate and moderate a pre-construction meeting with contractor, subcontractors, City and IFA representatives.
   b. Construction Management
      Review construction progress at the project site on a periodic basis, and at a minimum of two times a week. Prepare progress reports on a weekly basis. Schedule coordinate, and document construction project meetings.
   c. Submittal Review
      Receive, track, review, distribute, and respond to submittals from contractor. Develop a submittal tracking worksheet that is a living document and will be updated accordingly throughout the project.
   d. Pay Request Review
      Review pay request received from contractor. Prepare summary sheets on a monthly basis to facilitate funding related reporting. The format will be approved by IFA prior to the startup of the project.
   e. Construction Inspection
      Monitor progress of work and require that inspectors, special inspectors and agency inspectors are on site at the time or frequency as required by the project and deemed necessary the City. Oversees that the contractor prepares and maintains an updated construction schedule, and that the overall costs are tracked against the project budget. Collect inspection reports and delivery certifications from inspectors and material testers and spot check that materials are conforming to those specified.
   f. Electrical Inspection
      Perform construction management and inspection duties related to the electrical portions of the Pump Station. Complete the submittal reviews for the electrical and control components. Perform general electrical inspections and assist in the startup and functional testing of the pump station.

3. SURVEYING SERVICES
   a. Initial Setup
      Provide a surveyor to field verify the survey control points of the project.
   b. Calculations and Control Staking
      Perform stakeout calculations. Stake all structures and utilities as directed by contractor and provide sufficient controls. Prepare cut sheets and staking exhibits maps as requested by contractor.

4. PROJECT CLOSEOUT SERVICES
   a. Substantial and Final Completion
      Prepare preliminary and final itemized lists that documents the remaining times to be completed. Prepare Notices of Completions for substantial and final completion. Document receipt of all contractors' submittals required to demonstrate contractor's payment to subcontractors, prevailing wage, and related close-out items.
   b. Record Drawings

Update the existing plan set as necessary to provide City with a complete set of As-Constructed Record Drawings.

c. Operations & Maintenance Manuals

Develop a DEQ compliant O&M Manual for the Pump Station. This line item will include all plan check submittals required and revisions necessary to receive approval from DEQ.

This above scope is a preliminary list of items and contains the minimum items that the City believes would be necessary for this project. However, if appropriate, the proposer can recommend additional scope of services. These additional scope of services should be identified separately on the proposal as "optional" items. These additional scoping items shall also be identified separately on the fee.

MINIMUM QUALIFICATION

Proposer must meet the following minimum requirement:

1. Be a licensed engineer in the state of Oregon.
2. Demonstrate experience with public sector engineering of similar size and scope of the services being requested

RESOURCES TO BE PROVIDED

The City has made available on line the following documents for your use in preparation of preparing your proposal. A hard copy of any of the reports can be provided for a fee by contacting Jennifer Wirsing at 541-269-1181 ext. 2247 or jwirsing@coosbay.org to obtain directions and access to the ftp site.

1. Pump Station 4 Pre-Design Report, prepared by Civil West Engineering Services, Inc., dated November 2010
2. Contract Documents for the Construction of: Pumps Station 4 Volume 1, prepared by Civil West Engineering Services, Inc., dated August 2011
3. Contract Documents for the Construction of: Pumps Station 4 Volume 2, prepared by Civil West Engineering Services, Inc., dated August 2011
4. Joint Permit Application for Pump Station 4
5. November 4, 2012 letter from Department of Army Corps of Engineers
6. Permanent and Construction Easements for Project
7. Geotechnical Investigation Report – Wastewater Pump Statin 4 Improvement, prepared by SHN Consulting Engineers & Geologist, Inc., dated August 2010
8. Draft copy of a Level 4 Professional Service Agreement.

The successful proposer shall enter into an agreement with the City. The City has provided this contract language for review. If there is language in the City's Professional Service Agreement that the successful proposer would like omitted or modified, this request must be made prior to January 21, 2013. If no requests are made on or prior to this date, then it shall be assumed that the contract language and minimum insurance requirements are agreeable

GENERAL INFORMATION

INTERVIEWS

Proposers ***may*** be invited to an interview with the City's Selection Committee. The interviewees will be contacted regarding time and location of an interview per the Schedule for RFP Events presented in this package.

COMPLIANCE WITH RULES

Proposers responding to this RFP must follow its procedures and requirements. Except as otherwise provided in the RFP, applicable provisions of Oregon Administrative Rules Chapter 137, Division 47 shall apply to all personal service contracts of the City. Failure to comply with or complete any part of this RFP may result in rejection of your Proposal.

REQUEST FOR ADDITIONAL INFORMATION

Proposers may submit questions or a request for additional information. All questions and/or requests must be submitted either by mail or email:

City of Coos Bay
Public Works & Development Department
Attn: Jennifer Wirsing
500 Central Avenue
Coos Bay, OR 97420
jwirsing@coosbay.org

All requests for additional information, must clearly reference the "RFP for Bidding and Construction Management Services for Pump Station 4". All requests must be received no later than January 22, 2013 at 3:00 pm. The responses to the requests will be made available at the City's website:

http://coosbay.org/archive/requests

Hard copies can be mailed upon request for a fee.

SCHEDULE FOR RFP EVENTS

RFP Advertised	January 7, 2013
Deadline for Additional Information Request	January 22, 2013 at 3 p.m.
Response to Additional Information Requests	January 24, 2013
RFP Package Due	February 1, 2013 at 3 p.m.
Schedule Interview (subject to City's discretion)	February 11, 2013
Interviews (subject to City's discretion)	February 18 - 22
Negotiation w/ Selected Consultant	February 25-28, 2013
Council Consideration of Contract	March 19, 2013
Award of Project	March 20, 2013

The City shall enter into negotiations with the selected consultant. The negotiation portion of this process is a procedural step, and does not create any contract rights to the tentative Awardee. No binding obligation is created until a contract has been negotiated and executed by the City and the Awardee following the close of the period for submitting protest of the tentative award. Contract

forms will provided by the City to the successful proposer. A copy of the contract has been included in this RFP. If there is any contractual language that the consultant would like to discuss or have amended, this coordination shall be completed on or prior to December 28, 2012.

PROPOSAL WITHDRAWAL

Any Proposal may be withdrawn at any time before the "Proposal Due" date and time by providing a written request for the withdrawal to the issuing office. A duly authorized representative of the agency shall make the request. Withdrawal of a Proposal will not preclude the proposer from filing a new Proposal.

APPEALS

Bidders who wish to appeal a disqualification of proposal or the award of contract may submit the appeal in writing to the City Manager's Office within five (5) working days of the postmarked Notice of Award or disqualification. Disagreement with the process, e.g., scoring by evaluators, is not subject to appeal.

Address: City of Coos Bay
Public Works and Development Department
Attn: City Manager
500 Central Avenue
Coos Bay OR 97420

OWNERSHIP OF DOCUMENTS

Any material submitted by a proposer shall become the property of the City. Materials submitted after a contract is signed will be subject to the ownership provision of the executed contract.

CONFIDENTIALITY OF INFORMATION

All information and data furnished to the proposer by the City and all other documents to which the proposer's employees have access during the preparation and submittal of the Proposal shall be treated as confidential to the City. Any oral or written disclosure to unauthorized individuals is prohibited.

PUBLIC RECORD

All Proposals and information submitted by proposers are not open for public inspection until after the notice of intent to award a contract is issued. Except for exempt materials, all Proposals and information submitted by proposers will be available for viewing after the evaluation process is complete and the notice of intent to award is sent to all participating parties.

INDEMNITY

The Engineer of Record shall hold harmless, indemnify, and save the City, its officers, employees, and agents, from any and all liability claims, losses, or damages arising or alleged to arise during the performance of the work described herein by reason of any act or omission of the Engineer of Record or any of its agents, employees or representatives. The indemnity applies to both active and passive acts or other conduct.

EMPLOYMENT STATUS

Contractor shall perform the work required by this contract as an independent contractor. Although the Owner reserves the right to determine and modify the delivery schedule for the work to be performed and to evaluate the quality of the completed performance, the Owners cannot and will not control the means or manner of the Contractor's performance. The Contractor is responsible for

determining the appropriate means and manner of performing the work.

Contractor represents and warrants that the Contractor is not an employee of the City of Coos Bay and meets the specific independent contractor standards of ORS 670.600. Contractor is not an officer, employee, or agent of the Owners as those terms are used in ORS 30.265.

Contractor shall be responsible for any federal or state taxes applicable to any compensation or payments paid to Contractor under this contract and, the Owners will not withhold from such compensation or payments any amounts to cover Contractor's federal or state tax obligations.

Contractor is not eligible for any Social Security, unemployment insurance, or Workers Compensation, from compensation paid to Contractor under this contract except as a self-employed individual.

INSURANCE

1. General Liability shall be a per occurrence form and must cover the time for which the work is being performed.
2. Proof of insurance of not less than the amount required is to be provided. Written notice of cancellation of insurance shall be provided to the City/Agency not less than 30 days prior to the date of cancellation.
3. If the City/Agency is required to use Federal or State insurance policy limits, or is subject to the Federal or State tort claim limits, the limits required through this directive shall be superseded by such limits.
4. If a claim occurs where the amount of the claim exceeds the insurance policy limits required by this directive, the contractor assumes full responsibility for the payment of such claim.
5. Insurance policy limits shall not be less than those listed in this directive without the consensus of the City Manager, City Attorney and the City Risk Manger of Record. Insurance policy limits may be waived at the discretion of the City/Agency. Insurance policy limits may be required to be higher based upon the City Manager's review of the specific application for which the certificate is required.
6. Tail Coverage": If any of the required liability insurance is on a "claims made" basis, recipient shall maintain either "tail" coverage or continuous "claims made" liability coverage, provided the effective date of the continuous "claims made" coverage is on or before the effective date of the Contract/Agreement, for a minimum of 24 months following the later of:
   (1) Recipient's completion of all services and the City's/Agency's acceptance of all services required under the Contract/Agreement, or
   (2) The expiration of all warranty periods provided under the Contract/Agreement. Notwithstanding the foregoing 24-month requirement, if recipient elects to maintain "tail" coverage and the maximum time period "tail" coverage is reasonably available in the marketplace is less than the 24-month period described above, recipient shall maintain "tail" coverage for the maximum time period "tail" coverage is reasonably available in the marketplace for the coverage required.
7. Definitions:

Commercial General Liability: To cover bodily injury, death, and property damage. This insurance shall include contractual liability coverage for the indemnity provided under those listed in the Agreement/Contract, personal and advertising injury liability, products liability and completed operations liability. Coverage may be written in combination with Automobile Liability Insurance (with separate limits).

Professional Liability: To cover error, omission or negligent acts related to the professional services to be provided under the Agreement/Contract.

Automobile Liability: To cover each accident for bodily injury and property damage, including coverage for owned, hired, non-owned, leased, or rented vehicles as applicable. This coverage may be written in combination with the Commercial General Liability Insurance (with separate limits).
Builders Risk*:* To cover structures being built, temporary structures at the building site, and building materials not yet having become part of the building. The building materials are covered while on the insured location, in transit, or in storage at another location.
Installation Floater: To cover materials, equipment, and personal property while in transit, installation, and until coverage terminates according to the terms of the floater. This coverage can cover the property of others in the contractor's care, custody or control that is often excluded under the contractor's general liability coverage.
Umbrella Liability: To cover excess liability over several of the insured's primary liability policies. An excess liability policy may be what is called a following form policy, which means it is subject to the same terms as the underlying policies; it may be a self-contained policy, which means it is subject to its own terms only; or it may be a combination of these two types of excess policies. Umbrella policies provide three functions:
(1) To provide additional limits above each occurrence limit of the insured's primary policies;
(2) To take the place of primary insurance when primary aggregate limits are reduced or exhausted; and
(3) To provide broader coverage for some claims that would not be covered by the insured's primary insurance policies, which would be subject to the policy retention.

Most umbrella liability policies contain one comprehensive insuring agreement. The agreement usually states it will pay the ultimate net loss, which is the total amount in excess of the primary limit for which the insured becomes legally obligated to pay for damages of bodily injury, property damage, personal injury, and advertising injury.

Level 4 Insurance Requirements**:** Professional Services contracts/agreements over $50,000:

Commercial General Liability Per occurrence	$ 1,000,000
Professional Errors and Omissions liability (Per occurrence)	$ 2,000,000
Workers' Compensation	Statutory Limit
Applicable Federal (e.g., Longshoremen's)	Statutory Limit
Employer's Liability	$ 500,000
Umbrella/Excess Insurance (Per occurrence)	$ 2,000,000
Automobile Liability (Per occurrence)	$1,000,000

8. Should the Umbrella/Excess Insurance coverage combined with Commercial General Liability coverage not equal or exceed the minimum combined coverage shown, coverage must be increased to equal or exceed the minimum total coverage limits shown. If there is no Umbrella/Excess Insurance coverage, then the Commercial General Liability, Employers Liability, and Automobile Liability limits must be increased to equal or exceed the minimum total coverage limits shown. The Certificate of Insurance(s) and Endorsement(s) will be a part of the Contract and shall be provided to the City/Agency with endorsement(s) indicating that the Commercial General Liability insurance coverage is in effect which shall be primary and non-contributory with any insurance maintained by the City/Agency and include a per project aggregate (form CG 2503 05/09 or equivalent).

   Such certificate(s) and endorsement(s) shall name the City/Agency as an additional insured commercial general liability, automobile liability, and umbrella liability policies. Copies of such endorsements or coverage enhancements shall be attached to the certificate. A waiver of

subrogation under the workers' compensation and commercial general liability policies shall be provided. Thirty (30) days written notice shall be provided to the certificate holder prior to cancellation or significant modification of coverage. The Certificate of Insurance(s) and Endorsement(s) shall be provided to the City/Agency which will become a part of the Contract. Insurance Coverage provided must be underwritten by an insurance company deemed acceptable by the City/Agency. The City/Agency reserves the right to reject all or any insurance carrier(s) with an unacceptable financial rating.

Consultant will purchase and maintain property insurance for the entire work at the site on a replacement cost basis. Consultant shall obtain, at Consultant's expense, and keep in effect until final acceptance of the work performed under this contract, an Installation Floater or equivalent property coverage for materials, equipment, supplies, and tools to be used for completion of the work performed under this contract. The Installation Floater shall include coverage for testing, if applicable. The minimum amount of coverage to be carried shall be equal to the full amount of this contract. The Consultant will be responsible for any applicable deductibles.

9. Non-profits, community groups, and governmental entities that conduct meetings on city-owned property are exempt from the requirements of this administrative directive unless otherwise directed by the City Manager.

CITY OF COOS BAY
COOS COUNTY, OREGON

PUMP STATION 4
PRE-DESIGN REPORT

November 2010

REGISTERED PROFESSIONAL ENGINEER
56560PE
OREGON
JULY 9, 2001
JAMES G. PALLO
EXPIRATION DATE: 12/31/10

Prepared by:
Civil West Engineering Services, Inc
486 E Street
Coos Bay, Oregon 97420

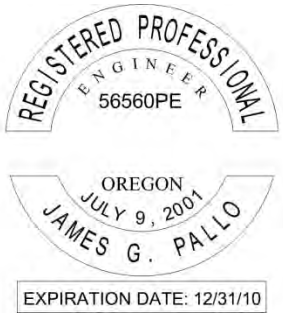
Civil West Engineering Services, Inc.

City of Coos Bay

Coos County, Oregon

PUMP STATION 4
PRE-DESIGN REPORT

November, 2010



Civil West
Engineering Services, Inc.

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1.0 Introduction

The City of Coos Bay owns and operates over 20 wastewater pump stations located throughout the community. The pump stations are used to lift raw sewage from one basin to another and eventually to the wastewater treatment facilities.

Pump Station 4 is located immediately adjacent to Blossum Gulch School. The original station was constructed in 1954 and then rebuilt and relocated in 1973. With 17 years since the last upgrade and 37 years since the original construction date, the pump station has outlived its useful life span and has become a maintenance and performance problem for the City.

During winter rain events, both pumps can run for several successive 24-hour periods without shutting down and without keeping up with flows in the basin. Basements in the basin have been known to overflow as a result of surcharging of manholes in the sewer basin.

The pump station is constructed contiguous to the Blossum Gulch Creek. The creek laps against the side of the wetwell on the north side of the pump station structure. Blossum Gulch Creek is a salmonid bearing stream that is utilized as a minor hatchery part of the year. As such, the environmental concerns for this station are significant. The City does not own property adjacent to the existing station to allow for new construction. Therefore, two easements were obtained to allow construction of a new pump station and forcemain across Blossom Gulch Creek behind an apartment complex at the corner of Anderson Avenue and 10th Street. A preliminary layout for a new pump station was developed as part of the 2006 Wastewater Collection System Master Plan (HBH).

Three improvement options have been developed in this report for Pump Station 4. Option 1 is a “no action taken” option. Option 2 is to provide significant improvement and upgrade to the existing facility and Option 3 constructs a new facility including wetwell with submersible pumps, new forcemain, and new gravity piping.

All recommendations in this report are consistent with Oregon Department of Environmental Quality (DEQ) Oregon Standards for Design and Construction of Wastewater Pump Stations published in May of 2001.

1.1 *Service Area*

Pump Station 4 is located on the northwest corner of 10th Street and Curtis Avenue in Coos Bay. This pump station provides service to Basin W as identified on the system map presented below in Figure 1.1.2. This Basin drains the area north of Blossom Gulch Creek from the West end of Anderson Avenue and south of Central Avenue to 6th Street between Anderson and Donnelly Avenues. Basin W is drained to the pump station and then pumped through a 6-inch forcemain into Basin R which then flows by gravity to Coos Bay Pump Station #1.

The Basin is a mix of single and multifamily residences, including Blossum Gulch School and a few minor commercial enterprises.

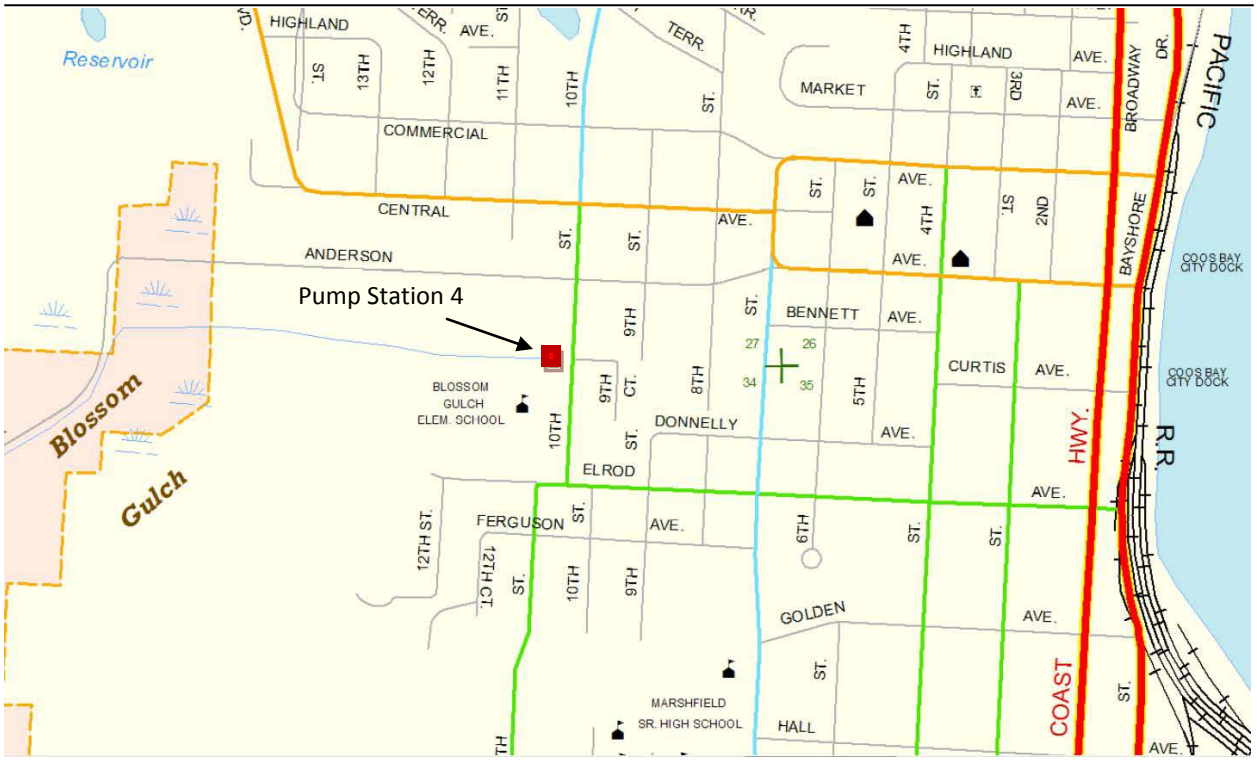


Figure 1.1.1 – Vicinity Map

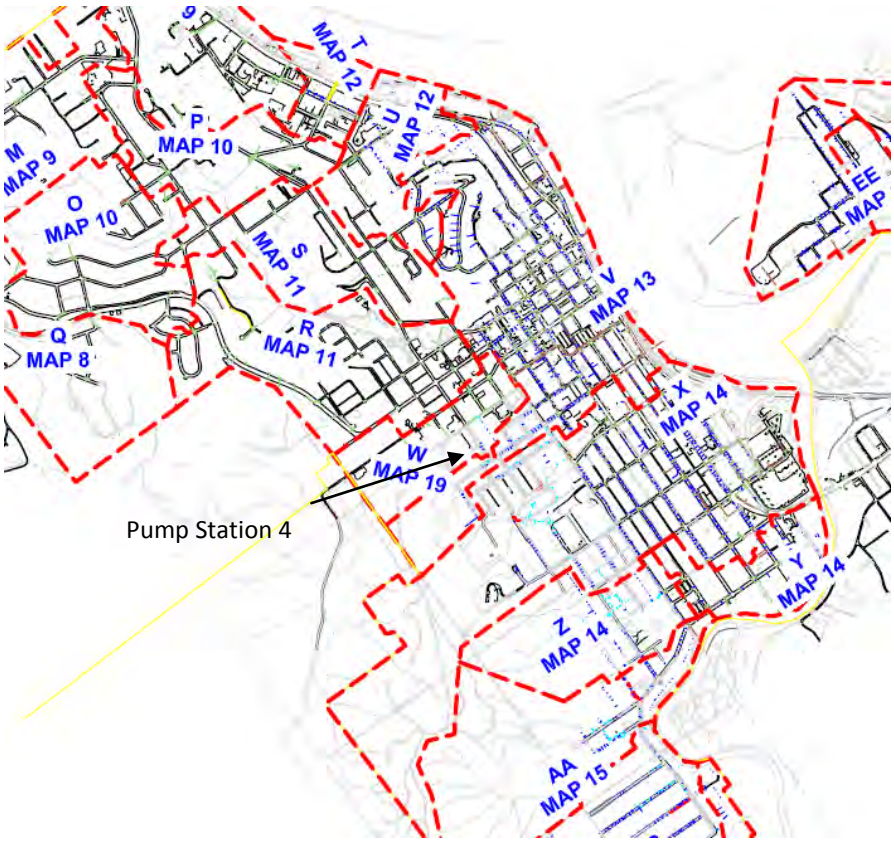


Figure 1.1.2 – Adjacent Basins Map

1.2 *Existing Lift Station Data*

The existing Pump Station 4 was constructed in 1973 along with numerous other conveyance system improvements. The lift station is a wetwell type. Much of the original electrical components are still in use. The original pumps were replaced in 1993 and presently consist of Hydromatic 40MMP double chamber self-priming non-clog pumps. The motors on the existing pumps are 10 horsepower, 230/460 Volt, 60 Hz, 3-phase, 1,750 rpm units manufactured by D&D. The power supply for the pump station is 240 Volt, Delta configuration. The pumps operate on a lead/lag basis, with the second pump acting as a backup when flows exceed the capacity of the lift station. The pumps are manually switched to operate in either the lead or lag position.

The pump station is not equipped with an overflow. According to the NPDES Permit #100699 overflows discharge into the Isthmus Slough. Overflows occur from manholes and building basements located in the immediate vicinity of the pump station.

Table 1.2 – Pump Station 4 – Existing Data

Pump Station Components	
Location	On Northeast corner of 10th Street and Curtis Avenue
Original Construction/Last Upgrade	Originally constructed in 1954, rebuilt in 1973, pump upgrades in 1993
Type of Station	Round concrete wet well, 5 foot diameter, 17 feet deep, 2500 gallons
Pump Type	2 Hydromatic 40MMP self-priming pumps
Motor Type	D&D
Motor Data	10HP, 240Volt, 60Hz, 3-Phase, 1750 RPM
Pump Performance	325 GPM at 40 feet total dynamic head 1 pump running
Overflow Point	None, manholes, adjacent residences, into creek drainage
Overflow Discharge	Blossom Gulch Creek, outlets to Isthmus Slough
Auxiliary Power	30 kW (240 V) Onan Generator; diesel powered; fuel consumption measured at 3.1 gal/hr.
Fuel Capacity	110 Gallons in two 55 gallon drums, good for 35 hours of backup power
Force Main	Approximately 450 feet of 6-inch Cast Iron
Discharge Manhole	R-51
Phone Circuit	Verizon- 269-7459
Alarms	High wet well, low wet well, power failure, generator run, pump failure.
Pump Station Deficiencies	
Building	Flat roof has caused problems with leaks in the building and corrosion of metals in the system.
Controls/Autodialer	Old autodialer system needs to be replaced to standardize to City system. Floats have been a problem due to debris and other issues in the wet well.
Pumps	Pumps are deficient for existing flows. Self priming pumps are problematic.
Generator	Age of generator has made it very difficult to maintain and obtain replacement parts. The generator is in excess of 30 years old and should be replaced along with a new automatic transfer switch (ATS).
Site	Very poor site conditions for expansion or replacement of the station. Immediately adjacent to sensitive creek, in the parking lot of busy school, and little or no room for expansion for upgrade.

The force main from the Pump Station 4 lift station consists of approximately 450 feet of 6-inch cast iron pipe. The force main discharges into Manhole R-51 in the adjacent basin to the north.

1.2.1 Description of Existing Facilities

Existing deficiencies with Pump Station 4 are numerous. The most significant problem is that the pump station is undersized for present day peak flows. Overflows commonly occur in winter conditions, causing effluent to back up into the stream and nearby buildings. Flooding from the stream itself also overflows into the pump station resulting in the pump station and Blossom Creek commonly mixing with each other.

- The interior of the pump station is small, making working conditions difficult and servicing problematic.
- Inadequate access during school days as parking is limited.
- Pump station is located directly on a salmonid stream which commonly backs up at the adjacent culvert with debris causing flooding.
- The piping inside the building has experienced corrosion.
- The control building has a limited footprint. Clear space in front of electrical equipment is inadequate to meet current electrical code requirements.

1.2.2 Overflow

The Pump Station 4 is not equipped with an overflow. Overflows occur in nearby buildings and surcharge manholes at the lowest hydraulic grade points. These areas of overflow ultimately flow into Blossom Gulch Creek. Overflow travels down Blossom Gulch Creek eastward into the Isthmus Slough, a tidal inlet of Coos Bay. This area of Coos Bay regularly floods when high tides combine with heavy precipitation and westerly storm winds.

1.2.3 Forcemain and Discharge

The 6-inch force main for the Pump Station 4 is 37 years old and constructed out of Cast Iron (CI) material. The force main is routed below the adjacent creek and under 10th Street to Manhole No. R-51 where it is discharged into the gravity collection system.

1.2.4 Effects of Hydrogen Sulfide

Hydrogen Sulfide gas is released when raw sewage is allowed to stagnate for long periods in anaerobic conditions. This gas is highly corrosive and will attack concrete, asbestos concrete, copper, iron, and steel. The concentration of hydrogen sulfide generated is related to the characteristics of the sewage as well as the detention times in the wetwell and forcemain.

The existing discharge manhole was inspected to determine if there is any hydrogen sulfide damage. The existing discharge manhole was visually inspected and the concrete was probed with sharp screwdriver to identify any damage from hydrogen sulfide. The existing manhole has signs of hydrogen sulfide damage. Large pieces of concrete are broken and lying at the bottom of the manhole. Probing conducted at the surface of the concrete under the manhole ring resulted in scales of concrete falling from the manhole sides. The manhole is shallow and should be replaced as it has been undergoing damage for some time.

Sewage does not remain for long periods in the wetwell or force main during dry weather flows. Pump Station 4 is controlled to run at regular intervals. Detention times for both the existing forcemain and wetwell are under 20 minutes for summer flows.

Existing records do not indicate if the discharge manhole was installed when the original pump station was built 56 years ago or 37 years ago with the more recent relocation. System operators do not know if the deterioration of the concrete has been ongoing, ceased or become a recent development. Therefore Hydrogen Sulfide controls will be considered as part of the design.

Figure 1.2.4 – Discharge Manhole and Hydrogen Sulfide Evidence

2.0 Flow Analysis

This section provides discussion and analysis of wastewater flows measured at Pump Station 4 and WWTP#1, rainfall data, and statistical analysis used to project expected wastewater flows during a 5-year, 24-hour storm event.

2.1 *Flow Definitions*

Wastewater characteristics tend to vary seasonally. The two seasons are defined below:

Dry Weather Period: Defined as the period when the precipitation and streamflows are low. This period is defined in the Oregon Administrative Rules (OAR 340-41-215) as May 1 through October 31.

Wet Weather Period: Defined as the period when streamflows, rainfall and groundwater levels are high. This period is defined in OAR 340-41-215 as November 1 through April 30.

The following terms will be used in flow analysis and flow projections in this Study:

Average Annual Flow: Total wastewater flow for a complete 12-month period, from January 1 through December 31, divided by the total number of days in the year.

Average Daily Dry-Weather Flow (ADWF): Total wastewater flow for the dry-weather period divided by the number of days in the period.

Maximum Monthly Dry-Weather Flow (MMDWF): Total wastewater flow for the month with the highest flow during the dry-weather period, divided by the number of days in the month.

Average Daily Wet-Weather Flow (ADWF): Total wastewater flow for the wet-weather period divided by the number of days in the period.

Maximum Monthly Wet-Weather Flow (MMWWF): Total wastewater flow for the month with the highest flow during the wet-weather period, divided by the number of days in the month.

Peak Day Average (Wet-Weather) Flow (PDAF): Total flow for the day with the highest wastewater flow during the wet-weather period.

Peak Instantaneous Flow (PIF): Flow for the peak hour of the year, expressed as a daily flow.

The following terms will be used in the statistical analysis of flow rates:

10-Year Maximum Monthly Dry-Weather Flow ($MMDWF_{10}$): The monthly average dry-weather flow with a 10% probability of occurrence.

5-Year Maximum Monthly Wet-Weather Flow ($MMWWF_5$): The monthly average wet-weather flow with a 20% probability of occurrence.

5-Year Peak Daily Average Flow ($PDAF_5$): The peak day average flow associated with a 5-year storm event.

5-Year Peak Instantaneous Flow (PIF_5): The peak instantaneous flow attained during a $PDAF_5$.

2.2 *Measured Flow Data*

Daily pump runtime and overflow records are not available. Control of the pump station is accomplished through floats. No meters are installed that record flow data or overflows. A winter flow study was conducted to evaluate and analyze basin flows. Pump curves for the existing Pump Station 4 configuration were developed in the 2008 Plant 1 Facilities Plan (West Yost). Based on the existing configuration and pump curves, the flow rate of 325 gpm at 40 feet of total dynamic head has been calculated for each pump. The total flow leaving the lift station has been calculated by measuring the flow into the station at the inlet of the nearest manhole.

Daily rainfall totals are recorded at the North Bend Airport. These rainfall totals are used in subsequent flow calculations.

2.3 *Flow Analysis*

Calculating the total volume of wastewater leaving the lift station provides a reasonable measure of the AAF. Calculated flows also describe the relationship between rainfall and lift station flows. However, in the absence of several years' worth of hourly inflow records, it will be necessary to use statistical analysis to determine reasonable $MMWWF_5$, $PDAF_5$, and PIF_5 estimates.

Like many communities in western Oregon, the City of Coos Bay struggles with high volumes of wastewater flows caused by inflow and infiltration into the sanitary sewer system during the wet season. The flow analysis presented in this section is based on the Oregon DEQ guidelines for making wet-weather and peak flow projections for sewage treatment in western Oregon (first published in 1996). These guidelines describe a detailed method for estimating wet-weather flow and peak flows in wastewater collection systems. This method is used to develop the minimum estimate for current flows from which to project future flowrates.

2.3.1 Dry Weather Flow

As indicated in the referenced DEQ guidelines, the 10-year MMDWF is the anticipated monthly flow corresponding to the monthly rainfall accumulation, typically occurring in the month of May, with a 10% probability of occurrence in any given year.

The 10-year MMDWF of 0.139 MGD, as shown in Graph #1 (Figure 2.3.1) below, corresponds to the 10-year May rainfall of 6.5 inches. The graph in Figure 2.3.1 is based on flow records taken with a Hach Sigma 910 flow meter at the manhole preceding Pump Station 4 from the period of August 27, 2009 through March 17, 2010. The 0.8 and 0.9 probability rainfall values shown on Graph #1 are from the Climatology of the United States No. 20 for years 1971 through 2000 (most recently available) published by the National Climate Data Center.

A summary of data points used to create Graph #1 are included in Table 2.3.1 below.

Table 2.3.1 – Rainfall and Flow Data

	North Bend Airport Measured Rainfall	Measured Monthly Avg Day Flow
Oct	5.25	0.082
Nov	7.89	0.144
Dec	6.99	0.144
Jan	9.14	0.169
Feb	7.13	0.188
Mar*	6.97	0.190
.8-jan	13.67 **	
.9-may	6.5 **	

*March Data collected from 3/1/2010 to 3/17/2010 and projected through the end of the month

* Data from Climatology of the US No. 20 for years 1971 - 2000 published by the National Climate Data Center

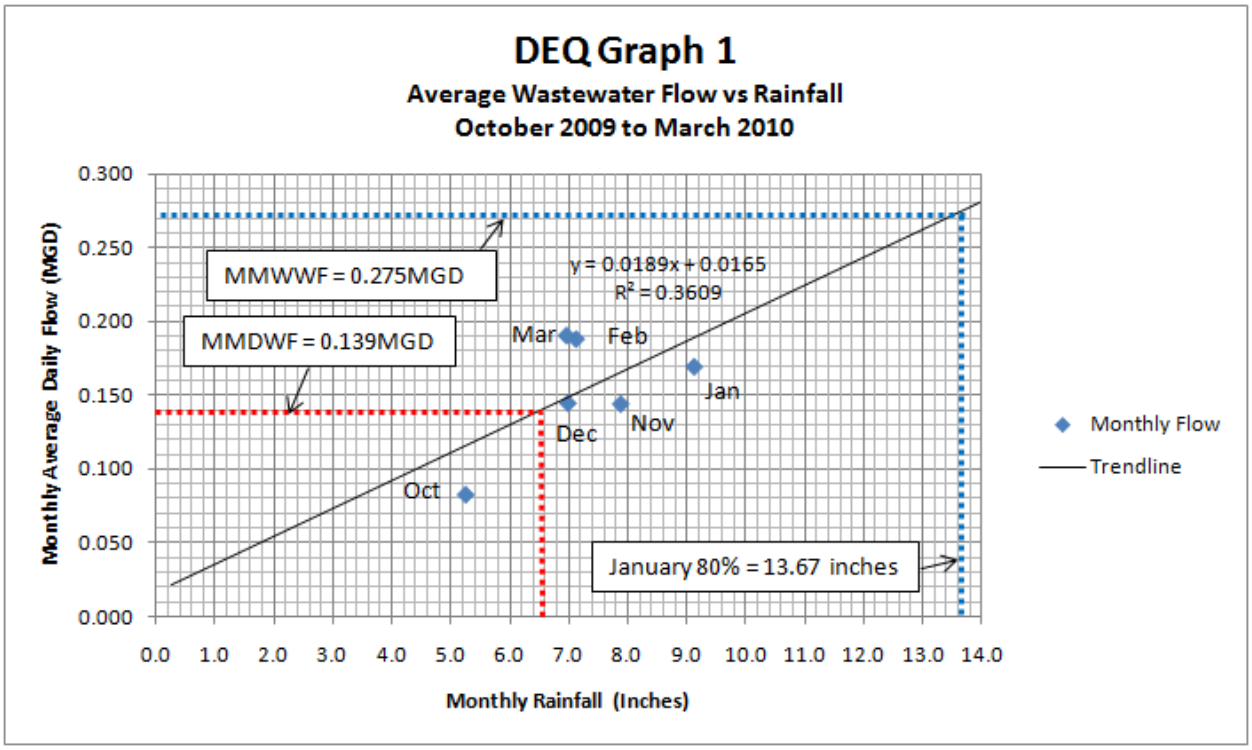


Figure 2.3.1 – DEQ Graph #1

2.3.2 Wet Weather Flow

The referenced DEQ design guidelines also indicate that high groundwater is usually not attained until January west of the Cascades, and heavy storms generally do not begin to cause a reliable or consistent infiltration response until January. Therefore, the MMWWF also is expected to occur in January. The 5-year recurrence storm corresponds to 13.5 inches of monthly rainfall based on the rainfall records from the National Climate Data Center for the month of January for the City of Coos Bay. When plotted with actual recorded events, the current 5-year MMWWF is shown to be 0.275 MGD, as shown in Figure 2.3.1 above.

Peak Day Average Flow (PDAF) corresponds to the 5-year 24-hour storm event as defined by NOAA isopolluvial maps. The isopolluvial map for the 5-year 24-hour storm event is provided in the Appendix C. Based on the NOAA maps, the 5-year 24-hour event for the City of Coos Bay is 4.5 inches of rain.

To determine the PDAF using the DEQ methodology, actual events are plotted and a best-fit trendline is used to approximate the character of the system under different rainfall events. As in the graph above, data from fall/winter of 2009/10 is used in the PDAF calculation. See Graph #2 in Figure 2.3.2a following. A summary of data points are included in Table 2.3.2a below.

Table 2.3.2a – Rainfall and Flow Data

Date(s)	Average 24 Hour Flow (Gallons)	Rainfall (Inches)
Nov 17th	299,690	1.49
Nov 20th	241,980	1.33
Dec 15th	289,853	1.39
Jan 12th to 13th	342,787	2.46
Jan 15th	237,629	1.31
Feb 23rd	164,080	1.16
Feb 26th	406,881	1.68
Mar 11th to 12th	343,038	2.36

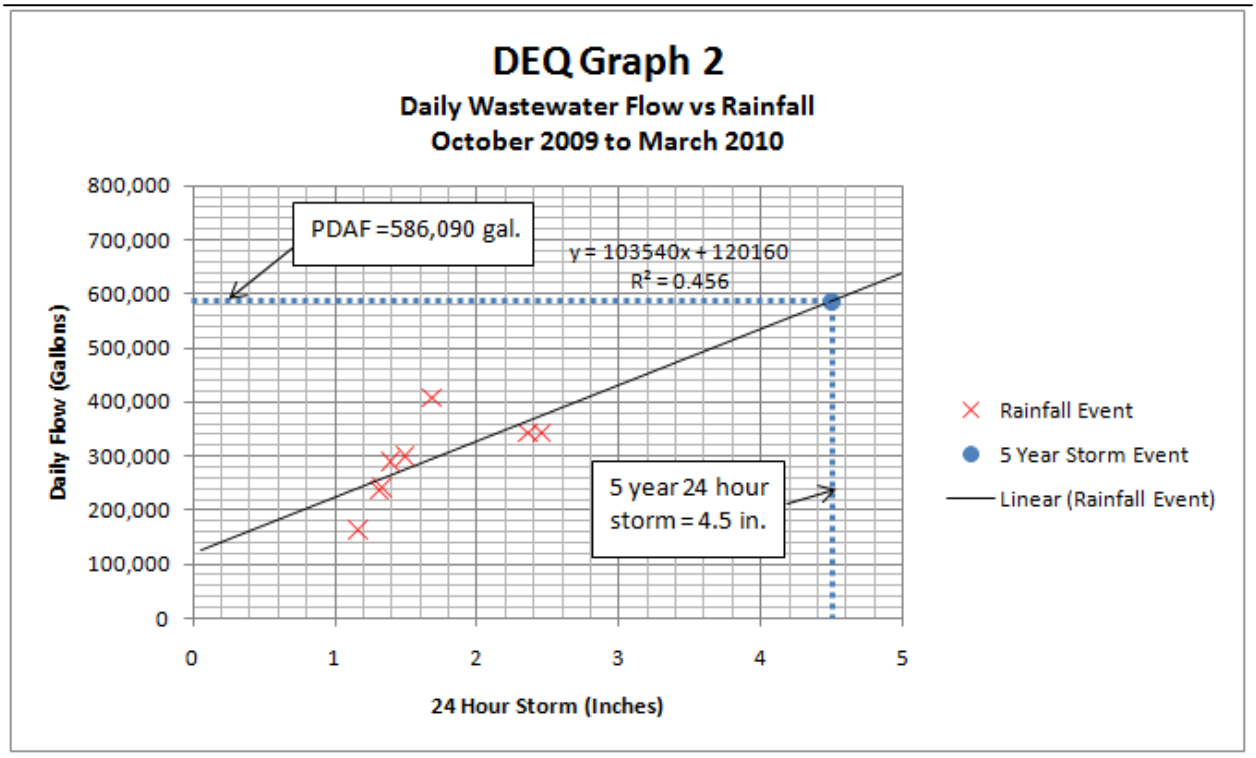


Figure 2.3.2a – DEQ Graph #2

Based on Graph #2 above, the current $PDAF_5$ is about 0.586 MGD.

Data from individual storm days for the monitoring period required that two days be combined and the flow averaged when the actual storm event started on one day and finished the next. There were two such events, one in January and one in March.

DEQ guidelines for pump station design require wastewater lift stations to be sized for the projected peak instantaneous flow (PIF_5). The current PIF_5 for the Pump Station 4 lift station is estimated using a statistical method developed by the Oregon DEQ as described in the previously referenced guideline.

Graph #3 (Figure 2.3.2b) below illustrates the statistical method used to calculate the PIF_5 flow handled by the Pump Station 4 lift station. Using this method, the following points are plotted:

1. The average annual flow (AAF) rate is the mean of summer (ADWF) and winter (AWWF) flow rates and has a probability of occurrence of 6 in 12, or a 50% probability.
2. The MMWWF as determined in Graph #1. This corresponds to a probability of exceedance of one in 12 (1/12) months, or 8.3%.
3. The 5-year peak week has a statistical probability of occurrence equal to 1/52 days or 1.9% probability and is determined from Graph #3 below.
4. The $PDAF_5$ as determined with Graph #2. The $PDAF_5$ has a statistical probability of occurrence equal to one in 365 (1/365) days, or 0.27% probability.
5. The PIF_5 (peak hour) is determined using the Graph #3 below, and occurs once in 8,760 (1/8760) hours, or with a probability of 0.011%.

Once points 1, 2 &3 are plotted on a probability x 2-log cycle graph, a best fit line is applied through the points. The value where the best fit line crosses a percent probability of exceedance of 0.11 (0.011%) is determined to be the PIF_5 and at 0.19 (1.9%) the 5-year peak week. As illustrated in Graph #3, the

existing PIF_5 for the Pump Station 4 lift station is approximately 0.985 MGD and the 5-year peak week is approximately 0.400 MGD.

A summary of flows and corresponding probability of occurrence is included in Table 2.3.2b below.

Table 2.3.2b – Flow Rate and Probability Data

Flow Description 2009 Conditions	Flow Gallons	% Probability
AAF	126,424	50.000%
MMWWF5	274,863	8.300%
5-Year Peak Week	400,000	1.900%
PDAF5	586,090	0.270%
PIF5	985,000	0.011%

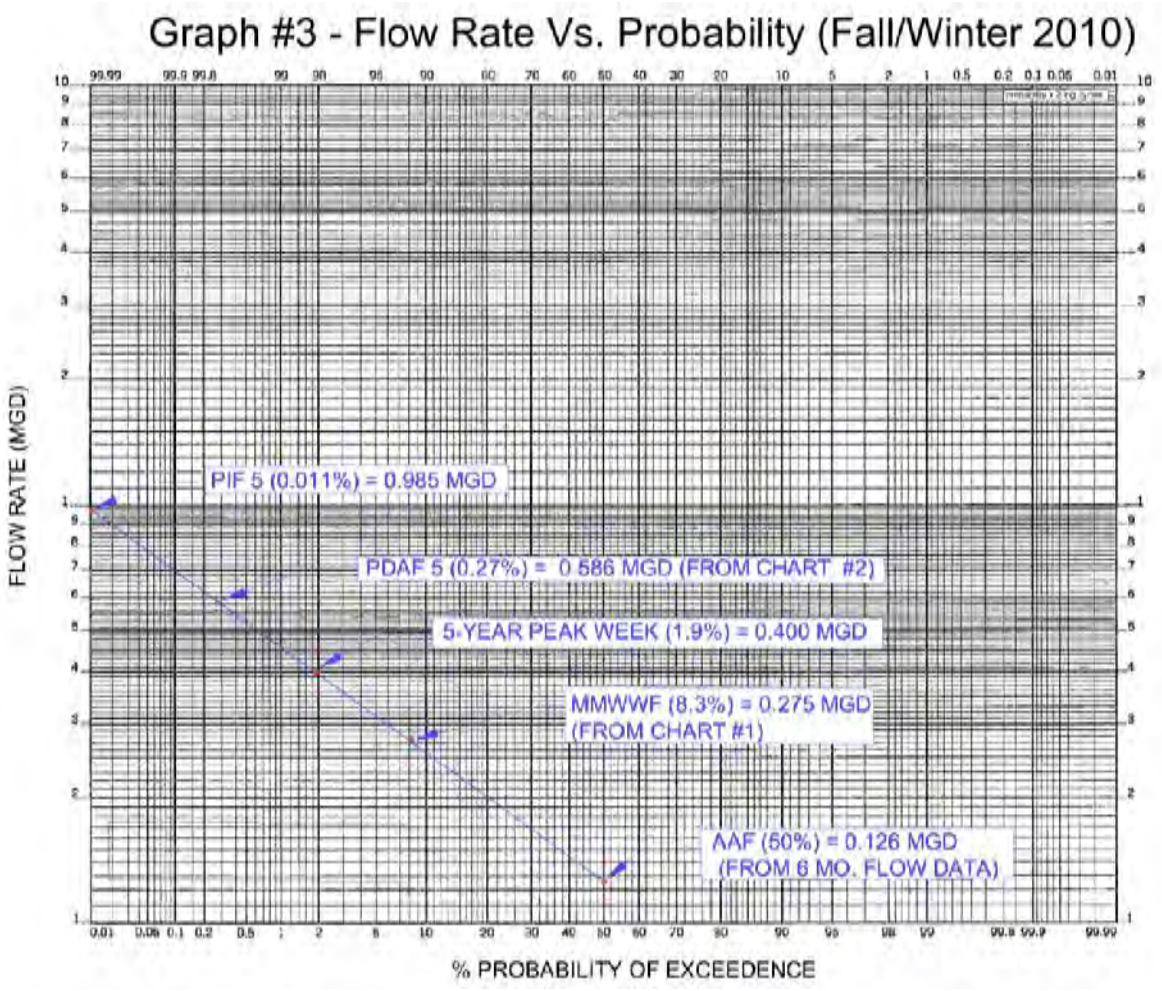


Figure 2.3.2b – DEQ Graph #3

A summary of calculated flows into the Pump Station 4 Lift Station is included in the Table 2.3.2c below.

Table 2.3.2c – Flow Rate Summary

Flow Description 2009 Conditions	Flow Gallons	Flow GPM
AAF	126,424	88
MMDWF	139,350	97
MMWWF5	274,863	191
5-Year Peak Week	400,000	278
PDAF5	586,090	407
PIF5	985,000	684

2.4 *Inflow and Infiltration Discussion*

Nearly all coastal communities in Oregon struggle with the issue of inflow and infiltration (I/I) within their wastewater collection systems. Infiltration is defined as flows that enter the collection system through underground paths. Infiltration is typically caused by rain-induced groundwater. Inflow is defined as flow that enters the collection system through surface paths.

The Environmental Protection Agency (EPA) has developed a system to aid in the analysis of the I/I flows within their wastewater system. The EPA methodology is published in the EPA *Infiltration/Inflow Analysis and Project Certification* of May 1985. The EPA method requires that the system be analyzed under differing and extreme conditions and compared against an established benchmark to determine if the I/I levels are significant. The EPA benchmarks are:

EPA Criteria for Infiltration..... 120 gpcd
EPA Criteria for Inflow ..... 275 gpcd

Pump Station 4 flow measurements have been analyzed using the EPA methodology. The approximate infiltration, as measured during 7-day periods with no rainfall, is 209 gallons per capita day (gpcd). This is above the EPA threshold for excessive infiltration. The approximate inflow, measured as the peak day average flow during periods of winter rainfall, is 387 gpcd. This is also above the EPA threshold for excessive inflow. A summary of this analysis is presented in the Table below.

2 Periods of Wet Weather Dry Flows				Dates from PDAF storm calculation Wet Weather Flow			
Date	Rainfall	Daily Flows	Gallons Per Capita Day	Date(s)	Rainfall	Avg 24 Hour Flow	Gallons Per Capita Day
28-Nov-09	0.00	156,616		Nov 17th	1.49	299,690	
29-Nov-09	0.00	140,755		Nov 20th	1.33	241,980	
30-Nov-09	0.00	134,244		Dec 15th	1.39	289,853	
1-Dec-09	0.00	132,105		Jan 12/13	2.46	342,787	
2-Dec-09	0.00	124,030		Jan 15th	1.31	237,629	
3-Dec-09	0.00	115,258		Feb 23rd	1.16	164,080	
4-Dec-09	0.00	108,541		Feb 26th	1.68	406,881	
5-Dec-09	0.00	110,033		Mar 11/12	2.36	343,038	
6-Dec-09	0.00	105,355			Average	290,742	387
7-Dec-09	0.00	98,883					Total/751 persons
8-Dec-09	0.00	96,556					
9-Dec-09	0.00	106,331					
10-Dec-09	0.00	97,208					
	Average	117,378	156				
			Total/751 persons				
27-Feb-10	0.01	382,360					
28-Feb-10	0.00	220,239					
1-Mar-10	0.00	206,606					
2-Mar-10	0.11	199,064					
3-Mar-10	0.02	175,356					
4-Mar-10	0.02	146,120					
5-Mar-10	0.00	126,493					
6-Mar-10	0.00	116,931					
	Average	196,646	262				
			Total/751 persons				
	Combined Average		209				

Table 2.4 – I/I Analysis

The EPA and Oregon DEQ recommend conducting an I/I Cost-Effectiveness Analysis when a system exhibits either infiltration or inflow above the EPA thresholds. The cost-effectiveness analysis presents an estimate of the point at which the cost savings of wastewater conveyance and treatment is maximized. Sewer rehabilitation is considered cost effective if the expected cost of conveyance and treatment exceed the expected cost of rehabilitation. Typically the first 30% to 40% of I/I reduction through rehabilitation will prove cost effective. Problem areas within the collection system are identified through smoke testing, flow mapping and televising.

The City of Coos Bay has undertaken smoke testing in 2008/2009 and flow mapping during the winter of 2009/2010. Replacement and rehabilitation of deficient pipe sections has been an ongoing process for several years. The City budgets resources to target I/I reduction each year.

An I/I reduction study is being conducted for the City of Coos Bay independent of the Pump Station 4 predesign which will include a Capital Improvement plan. The City has ongoing efforts to correct I/I and will continue those efforts in this basin. The soil type and age of the system in the drainage basin has resulted in recurring I/I problems in Basin W. Many of the low lying areas in the drainage basin are built upon fill over sea shells and marsh silt. More recently, the pipeline under Anderson Avenue was replaced to reduce I/I with no improvement being observed.

2.5 *Design Flow Projections*

The number of persons per equivalent dwelling unit (EDU) can be determined using occupancy rates given in the 2003 Portland State University's Population Research Center U.S. Census for the City of Coos Bay. The 2003 Estimates were chosen as they are the source data for the Treatment Plant 1 facilities plan. The Census estimates that there are 10,312 total housing units within the Service Area and further estimates an average household size of approximately 1.96 persons. The total population of the city service area is 20,240 persons.

There are approximately 383 EDUs (2006 Collection System Master Plan, HBH) currently existing in Basin W, served by Pump Station 4. The total service area encompassing Basin W includes 58 acres, with no buildable space remaining within the UGB. Any future demand in the basin is expected to be minimal. Population estimated for Basin W calculated from EDU's is 751 persons.

Current *system wide* wastewater flows for Wastewater Treatment Plant 1 were presented in the 2008 Plant 1 Facilities Plan (West Yost). The average peak wet weather flow from the analysis period was 1004 gallons per capita day.

Analysis of the flow monitoring data for Pump Station 4 Lift Station for Aug 27, 2009 to Mar. 16th 2010 in Section 2.3.2 indicates a Peak 5 year flow of 0.985 MGD. The amount used per capita is: 985,000 gallons/751 persons = 1311 gallons per capita day peak flow. *System wide* peak wet weather flows are approximately 25% lower but this is considered reasonable as Basin W is known to be a more significant contributor to I/I than other drainage basins.

The total peak day I/I flow will be used for future I/I projections due to growth within the collection basins. Base flows are from the August and September flow monitoring data. The total peak day I/I is determined by subtracting the domestic base flow from the PIF_5, as follows:

Existing PIF I/I = 985,000 gpd – 52,517 gpd .....932,483 gpd

It is estimated that little further development will occur in the service Basin. There are plans to add 20 EDUs of expansion to the assisted living facility adjacent to the new pump station location, a total of 1 acre of land development. For future expansion I/I projections, the standard of 1000 gpd per acre is used. The projected future total is then 403 EDUs. A summary of the projected I/I flows for the service area follows:

Domestic Flow per EDU = 52517/383 EDUs..... 137 gpd
Proj. Domestic Flows = 403 EDU's x 137 gpd/EDU ..... 55,300 gpd
Growth PDAF I/I = 1 Acres x 1,000 gpd I/I per Acre ..... 1,000 gpd

The calculation above estimates the peak day average I/I Flow. To estimate the peak instantaneous I/I flow it is necessary to calculate the PIF/PDAF peaking factor. The PIF peaking factor is then used to estimate the PIF I/I due to projected growth within Basin W. The peaking factor and PIF I/I are calculated using the Pump Station 4 lift station flow data as shown below:

Peak Instantaneous Flow (PIF) from Figure 2.3.2b .....0.985 MGD
Peak Day Flow (PDF) from Figure 2.3.2a.....0.586 MGD
PF = PIF/PDAF Peaking Factor = 0.985 MGD/0.586 MGD.....1.68
Growth PIF I/I = Growth PDAF I/I (1,000 gpd) x 1.30.....1,680 gpd
Total PIF I/I = Existing PIF I/I + Growth I/I .....934,163 gpd

The total peak instantaneous flow (5-year, 24-hour storm) for the Pump Station 4 Lift Station is then the summation of the total growth PIF I/I and the projected domestic flow. The total PIF and subsequent flow rates are calculated as follows:

Total PIF = Proj. Domestic Flow + Total PIF I/I.....989,463 gpd
PIF Flow Rate = Total PIF/(24 hours x 60 minutes).....687 gpm

An approximate projected PIF of 687 gpm has been calculated; to offer a reasonable margin of safety, this will be rounded to 700 gpm. Therefore 700 gpm will be the basis of design for the Pump Station 4 Lift Station.

3.0 Lift Station Design Criteria

A number of factors affect the selection of pumps and the sizing of pump station mechanical piping. Pump sizing must consider both the projected maximum flows as well as the typical dry weather flows experienced at the lift station. It is important to consider pump run times during dry weather periods when making a lift station. Sizing of mechanical piping inside the lift station and the force main are generally dictated by fluid velocity requirements in the DEQ Oregon Standards for Design and Construction of Wastewater Pump Stations. This data is summarized in the Table below.

Table 3.0 - Pipe Velocities

Pipe Section	Flow Rates
Pump Suction Lines	3 to 5 Feet Per Second
Pump Vertical Discharge Lines	6 to 10 Feet Per Second
Pump Discharge Lines Including Force Mains	3.5 to 8 Feet Per Second
Minimum Daily Forcemain Velocity	2 Feet Per Second
Minimum Daily Forcemain Velocity to Re-Suspend Solids	3.5 Feet Per Second

Reduced fluid velocity in the forcemain is allowed for lift stations equipped with variable frequency drives (VFDs). According to DEQ standards, VFDs shall be designed and programmed to provide a flushing velocity in the forcemain of at least 3.5 feet per section at the beginning of each pumping cycle. After an initial flushing of the maximum practical duration, the pumping velocity may be reduced. The minimum pumping velocity allowed by DEQ for forcemains is 2 feet per second after initial flushing.

The DEQ recommended velocity through individual vertical pump discharge pipes of 6 to 10 ft/sec corresponds to flow rates of 530 to 880 gpm in a 6-inch diameter pipe. The recommended velocities of 3.5 to 8 ft/sec through pump discharge lines and forcemain corresponds to flow rates of 550 to 1,250 gpm in an 8-inch diameter pipe. The minimum daily forcemain velocity of 2 ft/sec corresponds to a flow rate of 310 gpm in an 8-inch pipe. The minimum daily forcemain velocity to re-suspend solids of 3.5 ft/sec corresponds to a flow rate of 540 gpm in an 8-inch pipe.

4.0 Improvement Options

4.1 *"Do-Nothing" Option*

The projected design flows of 0.989 MGD, or about 700 gpm, are significantly larger than the existing lift station capacity of 325 gpm while maintaining redundancy. Surcharging of the station and adjacent gravity system commonly occurs at flow rates over 400 gpm, which is the maximum lift station capacity

with both pumps running. Due to the lack of capacity of the existing lift station and impacts on critical fish habitat, doing nothing is not an option.

4.2 *Improvements to Existing Station*

The existing lift station is a wet pit type station; therefore capacity at the station could be increased through the installation of new pumps and larger suction lines. Another option is to install submersible pumps in the wetwell. However, there are several problems with significant upgrades to the existing lift station. The most significant issue is the location. It is directly on a salmonid spawning stream, below the 100 year flood plain, with one of the main pipelines running directly under the adjacent building. The current location would not pass environmental requirements if it were to be built as a new facility.

The wet pit is considered a confined space which necessitates special safety measures for entry. Harnesses, hoists, mechanical ventilation, gas detectors, extra personnel, special training and other considerations must be met before anyone can enter the pit.

Another potential problem is that current electrical code requirements will require all upgraded electronics to meet intrinsically safe or explosion proof requirements. This will increase the cost of all electrical and control components considerably. Additionally, clearance requirements around motor drives and electrical cabinets may require the construction of a new electrical/control building adjacent to the existing building and there is no property available to do this.

The existing station and forcemain are over 37-years of age. The reinforced concrete wet pit is in good condition. The cast iron piping from the gravity sewer and force main entering the wet pit both show signs of corrosion. The structures to be reused would require close inspection and rehabilitation. In addition to structural concerns, all of the existing pipe, valves, ladders and other items would require replacement.

The existing wetwell is accessed via a metal ladder attached to the wetwell walls.

The existing forcemain is 6-inch cast iron (CI) pipe approximately 450 feet in length. The velocity in the existing 6-inch CI forcemain at the current design flow rate of 325 gpm would be nearly 3.7 feet per second. This is well under the DEQ recommended maximum velocity in a forcemain of 8 feet per second. The existing forcemain is 37 years old and is still serviceable for past flow rates. Results from the flow analysis indicate that the current design point is insufficient to handle projected flows and to allow for future expansion a new 8-inch forcemain is suggested.

The option of significant renovation of the existing structures is not practical due to the limitations discussed above and the significant cost involved in the needed rehabilitation. This option would cost more than a new submersible lift station, but would still require confined space entry and would have significant operational difficulty due to the location. Additionally, the existing structures are 37 years old and are at the practical end of their useful life.

4.3 *New Submersible Lift Station*

The City wishes to eliminate the environmental spills related to the capacity and location of the lift station. The most practical way to accomplish this is to construct a new lift station wetwell away from Blossom Gulch Creek and to install new submersible pumps.

Construction of a new wetwell near to the existing lift station will require the land easements granted for such a use. A 7-foot diameter wetwell would be used for a duplex pump arrangement, or an 8-foot diameter wetwell would be used for a triplex pump arrangement. A new 12-inch influent pipe would be

extended from two existing manholes discharging into Pump Station 4 to the new wetwell, and the new lift station would discharge through a new forcemain into existing gravity piping.

Detailed options for a new lift station, forcemain and gravity piping are discussed below.

4.3.1 Option 1 – Duplex Lift Station

The duplex option would consist of a 7-foot diameter wetwell approximately 23-feet deep with two submersible pumps. To satisfy DEQ redundancy requirements, each pump would be sized to handle the projected PIF. To provide operational flexibility, each pump would be equipped with a variable frequency drive (VFD) to allow the pumps to start and stop gradually, and to allow reduced speed operation. Pumps would be operated using a programmable logic controller (PLC) to allow pumps to alternate lead/lag operation and to provide an initial flushing velocity of 3.5 ft/sec followed by a reduced 2 ft/sec steady velocity.

Pumps would be rail mounted submersible centrifugal solids handling pumps and explosion proof motors. Pump assemblies would be easily removed for service by lifting the pumps up through the top of the wetwell using a hoist. Check valves and plug valves would be installed in a below ground valve vault near the wetwell, providing convenient access to valves without confined space entry requirements. A single flowmeter would be installed in a below ground vault in a straight section of forcemain inside the fenced area on the lift station site.

This option would include a standby generator and a new masonry (CMU) electrical and control building to house the automatic transfer switch, VFDs, pump control panels, flowmeter totalizer and breaker panel. The generation could be installed outside with a weatherproof and sound deadening enclosure, or the electrical building could be expanded to house the generator as well. Paved access would be provided to the wetwell, vaults, generator and electrical building. The entire site would be surrounded by fencing and access to the site would be off of Pump Station 4 through an electric sliding gate.

4.3.2 Option 2 – Triplex Lift Station

The triplex option would consist of an 8-foot diameter wetwell approximately 23-feet deep with three submersible pumps. To satisfy DEQ redundancy requirements, each pump would be sized to handle half of the projected PIF. Therefore, two pumps running together will pump the total projected PIF with one additional pump providing redundancy. To provide operational flexibility, each pump would be equipped with a variable frequency drive (VFD) to allow the pumps to start and stop gradually, and to allow reduced speed operation. Pumps would be operated using a programmable logic controller (PLC) to allow pumps to alternate lead/lag operation and to provide an initial flushing velocity of 3.5 ft/sec followed by a reduced 2 ft/sec steady velocity. A triplex configuration allows the base flows to be handled by a single pump running closer to its optimal efficiency. Total operating hours will be divided evenly between three pumps, which will extend the life of the pumping system.

Pumps would be rail mounted submersible centrifugal solids handling pumps and explosion proof motors. Pump assemblies would be easily removed for service by lifting pump up through the top of the wetwell using a hoist. Check valves and plug valves would be installed in a below ground valve vault near the wetwell, providing convenient access to valves without confined space entry requirements. A single flowmeter would be installed in a below ground vault in a straight section of forcemain inside the fenced area on the lift station site.

This option would include a standby generator and a new masonry (CMU) electrical and control building to house the automatic transfer switch, VFDs, pump control panels, flowmeter totalizer and breaker panel. The generator could be installed outside with a weatherproof and sound deadening enclosure, or the

electrical building could be expanded to house the generator as well. Paved access would be provided to the wetwell, vaults, generator and electrical building. The entire site would be surrounded by fencing and access to the site would be off through an electric sliding gate.

4.4 *Forcemain Design*

The existing forcemain is 6-inch cast iron (CI) pipe approximately 450 feet in length. The velocity in the existing 6-inch CI forcemain at the design flow rate of 700 gpm would be nearly 8 feet per second. This is the DEQ recommended maximum velocity in a forcemain of 8 feet per second. The existing forcemain is 37 years old and is still serviceable, however buildup and corrosion inside the pipe has reduced its effective diameter creating velocities at the design flow rate in excess of the maximum recommended velocity. As the existing forcemain is not close to the proposed pump station, and to properly support the design flow rate, a new 8-inch forcemain is recommended.

An 8-inch HDPE forcemain, having a smaller then nominal diameter, will handle both peak flows and operate at peak pump efficiency during reduced flows while maintaining required velocities.

The current lift station discharges into an 8-inch gravity line running along an alley between Central Ave and Anderson Ave. The gravity line flows down a significant slope (24 ft/1000ft) and it is able to handle flows of up to 900 gpm.

As the City holds right-of-ways along the proposed forcemain route, no directional boring will be required and trenching methods can be utilized to lay the pipe. Approximately 480 feet of pipe will be needed. A new connection will be made to the existing manhole R-52 at the cross of 11th St and an alley way.

4.4.1 Operating and Surge Pressure Analysis

An analysis has been conducted to determine the maximum internal operating pressures that would be experienced by the proposed forcemain during peak flow conditions. The pressures will largely depend on frictional losses within the pipe, which are directly related to cross sectional area and pipe length. Table 4.4.1a provides a summary of the operating pressure possible within the proposed forcemain at the projected peak flow rate.

In addition to the internal operating pressure of the pipe, surge pressures must also be considered. Surges in forcemains occur regularly at pump start-up and shut-down, however, the amplitude of the surge can be minimized with the use of variable frequency drives programmed to slowly ramp motors up to speed at the beginning of a cycle, and gradually slow the motors down at the end of a cycle. More severe surges occur when the pumps suddenly stop (i.e. during a power failure) or when check valves are opened or closed. Sudden surges can result in water hammer, which is a shock wave that can be damaging to the pipe. Surge pressure calculations associated with water hammer consider physical properties of the pipe and the fluid being pumped. Surge pressures have been calculated and included in Table 4.4.1a for projected peak flow rate.

Table 4.4.1a – Forcemain Operating and Surge Pressure

Force Main Eq. Length (ft)	475
Hazen-Williams C	120
Static Head (ft)	44.5
Flow Rate (gpm)	700

Pipe Size/ Description	Inside Diameter (in)	Wall Thickness (in)	Area (sq ft)	Fluid Velocity (ft/sec)	Friction Head (ft)	Operating Pressure (psi)	Wave Speed (ft/sec)	Surge Pressure (psi)	Total Max. Pressure (psi)
8" IPS HDPE - DR 11	6.963	0.784	0.26	5.90	10	24	1220	97	116
8" IPS HDPE - DR 17	7.549	0.507	0.31	5.02	7	22	960	65	84
8" IPS HDPE - DR 21	7.663	0.454	0.32	4.87	6	22	900	59	78
8" IPS HDPE - DR 26	7.922	0.332	0.34	4.56	5	22	760	47	66
8" IPS HDPE - DR 32.5	8.062	0.265	0.35	4.40	5	21	680	40	59

The surge pressure listed in Table 4.4.1a above is the pressure increase due to the surge. The total pressure experienced by the pipe is the combination of the static pressure and the surge pressure. The highest calculated surge and total pressure occur at the projected peak flow rate of 700 gpm.

The surge pressures given in Table 3.0b above occur in conjunction with sudden fluid velocity changes in the forcemain. At the projected flow rate, the maximum total pressures that may occur in the forcemain are well within the pressure rating for every HDPE pipe size evaluated. In addition, design data published by the HDPE pipe manufacturers state that the allowable surge pressure may be up to 50% above the pipe pressure rating when surges are frequent, or up to 100% above the pipe pressure rating when surges are infrequent. The allowable surge pressure and rated operating pressure of several wall thicknesses of 8-inch HDPE pipe are included in Table 4.4.1b below.

Table 4.4.1b – HDPE Pipe Pressure Ratings

Pipe Size/ Description	Inside Diameter (in)	Wall Thickness (in)	Rated Pressure (psi)	Allowable Surge Pressure
8" IPS HDPE - DR 11	6.963	0.784	160	240
8" IPS HDPE - DR 17	7.549	0.507	100	150
8" IPS HDPE - DR 21	7.663	0.454	80	120
8" IPS HDPE - DR 26	7.922	0.332	65	97.5
8" IPS HDPE - DR 32.5	8.062	0.265	50	75

The commonly available wall thickness for 8-inch IPS HDPE pipe is DR 11, DR 17 and DR 26. As indicated in the tables above, fluid velocity requirements at the projected flow rate could be best met by using 8-inch IPS size DR 17 or DR 26 wall thickness HDPE pipe.

Surges within a forcemain are the result of oscillating pressure waves within a fluid and pressures associated with a surge event include both positive and negative pressure waves. Published pipe pressure ratings are for internal (positive) pressures, not negative (vacuum) pressures. Typically the highest surge pressure will be positive; however it is possible for portions of the forcemain to experience a negative (vacuum) pressure during a surge event. Vacuum Pressures equal in magnitude to the calculated positive pressure could deform HDPE pipe if applied for long periods of time. However, the vacuum caused by oscillating pressure waves will be very brief in duration and is not likely to cause deformation.

4.4.2 Hydraulic Transient Analysis

The potential for hydraulic transients due to column separation can be checked by comparing the inverse hydraulic grade line to the forcemain profile. If the forcemain lies well above the inverse hydraulic grade line, then column separation is likely to occur, resulting in hydraulic transients in the pipeline.

As can be seen in Figure 5 in the Appendix, the proposed pipe profile lies below the inverse hydraulic grade line at all points, therefore there is not a high likelihood of hydraulic transients within the pipeline.

4.5 *Pipe Summary*

The following table provides an overall summary of the recommended pipe sizes for the lift station and forcemain. The pipe sizing recommendations are based on the range of fluid velocities outlined in Table 3.0a above.

Table 4.5 – Recommended Pipe Sizes

Description	Inside Diameter	Location	Flow Rate at Max Velocity	Flow Rate at Min Velocity
6" Ductile Iron Discharge	6.22 in	Individual Pump Discharge	758 gpm	190 gpm
6" Ductile Iron Header	6.22 in	Discharge Manifold/Site Piping	758 gpm	190 gpm
8" HDPE DR 17 Forcemain	7.55 in	Forcemain	1117 gpm	280 gpm

These minimum and maximum flow rates are recommendations, actual flows may be outside of these recommendations under certain operating conditions.

5.0 System Head Curves and Pump Selection

System head curves have been developed for the duplex and triplex lift stations described in Section 4. Each alternate lift station configuration has been evaluated for both new and old pipe conditions. The following Hazen-Williams C values have been used in our analysis:

Table 5.0 – Hazen-Williams C Values

Pipe Material & Condition	C Value
HDPE Pipe – New	150
HDPE Pipe – Old	120
D.I. Pipe – New	150
D.I. Pipe – Old	120

Due to the resulting differences in operating conditions based on lift station configuration, forcemain length and pipe materials, each lift station option is analyzed separately in this Section. Pump selection is also based on the total dynamic head requirements of each option.

5.1 *Forcemain Design*

The proposed forcemain will extend from the lift station site to the manhole between Central and Anderson Avenues on South 11th Street. The forcemain will be trenched west and descend from the wetwell outlet height of 10.8ft to the 11th Street right of way. From the right of way the forcemain will

ascend north until it reaches the elevation of 38ft at the discharge manhole in drainage Basin R while maintaining a burial depth of greater than 36".

See forcemain alignment and profile in Figure 5 in the Appendix.

5.2 *Lift Station Duplex Option*

Lift station option 1 is a duplex configuration with submersible centrifugal pumps as discussed above. This option would utilize two identically sized pumps capable of handling the projected peak design flow of 700 gpm with one pump out of service.

5.2.1 Wetwell Design and Detention Time

As discussed previously, the proposed wetwell would be 7-feet in diameter for duplex configurations. The sump area of a 7-foot diameter wetwell is determined by the equation $A = \pi r^2$ therefore $A = \pi(3.5 \text{ ft})^2 = 38.5 \text{ ft}^2$.

The wetwell volume must be adequate to prevent excessive pump starts. Manufacturers of submersible centrifugal pumps recommend a maximum of 10 starts per hour. For constant speed pumps, the minimum wetwell volume between low water level (LWL) and pump on level can be calculated using the following formula:

$V_{required} = (T_{minutes} \times Q_{max}) / 4$

$V_{required}$ = Minimum volume in gallons
$T_{minutes}$ = Target time between pump starts in minutes
Q_{max} = Pump design capacity

Therefore: $V_{required}$ = (6 minutes x 700 gpm) / 4 = 1050 gallons (140 ft^3)

This establishes the minimum wetwell volume to handle larger flows expected during wet weather conditions with one pump out of service. Based on this calculation, it is determined that the high water level (HWL) should be a minimum of 3.6 feet above the LWL to ensure a maximum of 10 pump starts per hour for a 7-foot wetwell. When the water level reaches the HWL, the pump should ramp up to maximum capacity of 700 gpm.

However, during dry weather conditions it is important to avoid long detention time in the wetwell leading to septic conditions. In general, average detention time should be no more than 35 minutes during average flow conditions during July, August and September. The average maximum wetwell volume required to avoid septic conditions can be calculated as follows:

$V_{wetwell} = Q_{summer} \times 35$ minutes

$V_{wetwell}$ = Maximum wetwell volume to avoid septic conditions
Q_{summer} = Summer base flow during August – September = 38 gpm

Therefore: $V_{wetwell}$ = 38 gpm x 35 minutes = 1,330 gallons (178 ft^3)

Based on this calculation it is determined that the initial pump start elevation should be 4.62 feet above LWL. Since the maximum wetwell volume is greater than the minimum pump start volume, the pump levels will be controlled to minimize pump starts. At the start point, the pump should ramp up to the minimum speed of 3.5 ft/sec (500 gpm) required to re-suspend solids and then ramp down to 2 ft/sec (280

gpm) minimum velocity. A ramp up range will allow the pump to run at a variety of speeds to best match incoming flows. A summary of minimum pump start and stop levels is provided below:

Table 5.2.1 – Minimum Pump Start/Stop Levels

Point Description	Level Above Bottom of Wetwell	Water Surface Elevation
LWL (Pumps Off)	1.5 ft	-6.5 ft
Initial Start	5.1 ft	-2.9 ft
HWL (Ramp Up)	5.6 ft	-2.3 ft

Based on this proposed LWL and HWL the total wetwell volume would be 158 ft^3, which is greater than the minimum required volume of 140 ft^3 to avoid excessive pump starts as determined above. The volume between LWL and Lead Pump Start level is 139 ft^3 which is approximately 27 minutes of dry weather detention.

5.2.2 System Head

System head curves for the duplex lift station configuration (Option 1) have been developed for both high and low wet well levels. It is assumed that during dry weather base flow, one pump will run at reduced flow rate of 490 gpm for a short period of time to re-suspend solids in the forcemain and then ramp down to a flow rate of 280 gpm. The minimum flow rate of 280 gpm will be maintained until water reaches the LWL and the pump shuts off. However, when water levels reach the HWL, one pump will ramp up to maximum flow rate of 700 gpm and will maintain this rate until levels reach the initial pump start point. When the water level drops to the initial start point, then the pump rate can ramp down to a reduced rate.

Based on this operating strategy, the maximum flow rate of 700 gpm will occur at a water surface elevation of -2.3 feet or greater. Similarly, at the lowest water surface elevation of -6.5 feet, the pumping rate will be approximately 280 gpm. System head curves will be based on these operational assumptions.

System head calculations include an equivalent pipe length of 87.8 ft of 6” piping and 45.5f t of 8” forcemain piping to account for minor losses through fittings and transitions.

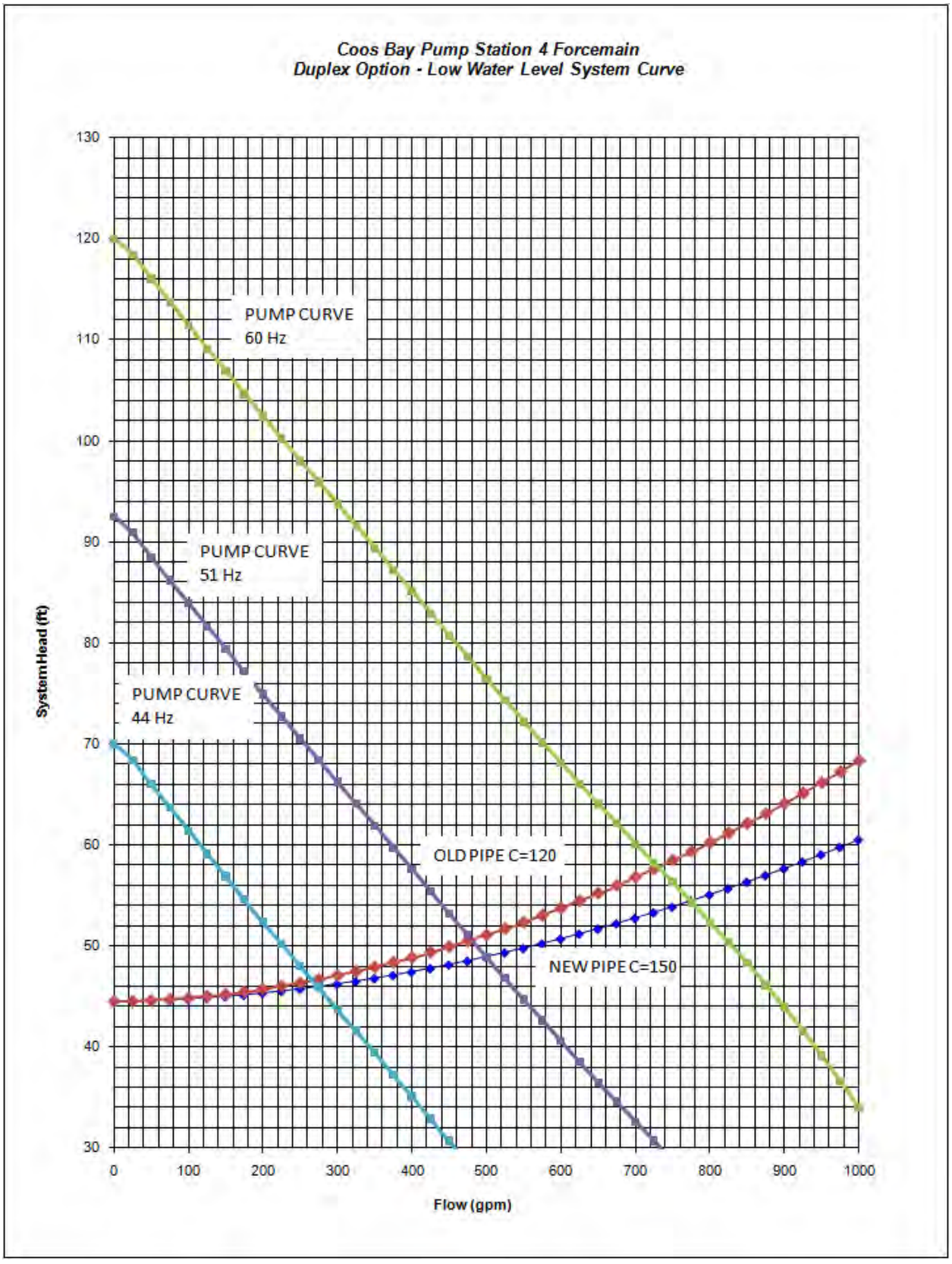


Figure 5.2.2a – System Head Curve – Duplex at Low Water Level

Table 5.2.2a – System Head Calculations

Duplex Pump Low Water Level System Head Curve

Hazen-Williams Formula

Input Data — Static Head = 44.5 — Low Water Wetw ell

Pipe 1 Diameter (in) =	6.22	Pipe 2 Diameter (in) =	7.55	Pipe 1 Diameter (in) =	6.22	Pipe 2 Diameter (in) =	7.55
C =	150	C =	150	C =	120	C =	120
Pipe Length (ft) =	122.6	Pipe Length (ft) =	504	Pipe Length (ft) =	122.6	Pipe Length (ft) =	504
Area (ft^2) =	0.2110	Area (ft^2) =	0.3109	Area (ft^2) =	0.2110	Area (ft^2) =	0.3109

		New Pipe Dynamic Head					Old Pipe Dynamic Head				
Flow (gpm)	Flow (cfs)	$H1_{friction}$	$H2_{friction}$	$HT_{friction}$	$V^2/2g$ (pipe 3)	**HT**	$H1_{friction}$	$H2_{friction}$	$HT_{friction}$	$V^2/2g$ (pipe 3)	**HT**
0	0.000	0.00	0.00	0.00	0.00	**44.50**	0.00	0.00	0.00	0.00	**44.50**
25	0.056	0.01	0.01	0.02	0.00	**44.52**	0.01	0.02	0.02	0.00	**44.53**
50	0.111	0.02	0.04	0.06	0.00	**44.56**	0.03	0.06	0.09	0.00	**44.59**
75	0.167	0.05	0.08	0.13	0.00	**44.63**	0.07	0.12	0.19	0.00	**44.69**
100	0.223	0.08	0.13	0.21	0.01	**44.72**	0.12	0.20	0.32	0.01	**44.83**
125	0.279	0.12	0.20	0.32	0.01	**44.84**	0.19	0.30	0.49	0.01	**45.00**
150	0.334	0.17	0.28	0.45	0.02	**44.97**	0.26	0.42	0.69	0.02	**45.20**
175	0.390	0.23	0.37	0.60	0.02	**45.13**	0.35	0.56	0.91	0.02	**45.44**
200	0.446	0.30	0.48	0.77	0.03	**45.30**	0.45	0.72	1.17	0.03	**45.70**
225	0.501	0.37	0.59	0.96	0.04	**45.50**	0.56	0.89	1.45	0.04	**45.99**
250	0.557	0.45	0.72	1.17	0.05	**45.72**	0.68	1.09	1.77	0.05	**46.32**
275	0.613	0.54	0.86	1.39	0.06	**45.95**	0.81	1.30	2.11	0.06	**46.67**
300	0.668	0.63	1.01	1.64	0.07	**46.21**	0.95	1.52	2.47	0.07	**47.05**
325	0.724	0.73	1.17	1.90	0.08	**46.48**	1.10	1.77	2.87	0.08	**47.45**
350	0.780	0.84	1.34	2.18	0.10	**46.78**	1.27	2.03	3.29	0.10	**47.89**
375	0.836	0.95	1.52	2.47	0.11	**47.09**	1.44	2.30	3.74	0.11	**48.35**
400	0.891	1.07	1.72	2.79	0.13	**47.42**	1.62	2.59	4.22	0.13	**48.84**
425	0.947	1.20	1.92	3.12	0.14	**47.76**	1.81	2.90	4.72	0.14	**49.36**
450	1.003	1.33	2.13	3.47	0.16	**48.13**	2.02	3.23	5.24	0.16	**49.90**
475	1.058	1.47	2.36	3.83	0.18	**48.51**	2.23	3.57	5.80	0.18	**50.48**
500	1.114	1.62	2.59	4.22	0.20	**48.92**	2.45	3.92	6.37	0.20	**51.07**
525	1.170	1.77	2.84	4.61	0.22	**49.33**	2.68	4.29	6.98	0.22	**51.70**
550	1.225	1.93	3.09	5.03	0.24	**49.77**	2.92	4.68	7.60	0.24	**52.34**
575	1.281	2.10	3.36	5.46	0.26	**50.22**	3.18	5.08	8.26	0.26	**53.02**
600	1.337	2.27	3.64	5.91	0.29	**50.70**	3.44	5.50	8.93	0.29	**53.72**
625	1.393	2.45	3.92	6.37	0.31	**51.18**	3.71	5.93	9.63	0.31	**54.45**
650	1.448	2.64	4.22	6.85	0.34	**51.69**	3.99	6.37	10.36	0.34	**55.20**
675	1.504	2.83	4.52	7.35	0.36	**52.21**	4.27	6.84	11.11	0.36	**55.97**
700	1.560	3.02	4.84	7.86	0.39	**52.75**	4.57	7.31	11.88	0.39	**56.77**
725	1.615	3.23	5.16	8.39	0.42	**53.31**	4.88	7.80	12.68	0.42	**57.60**
750	1.671	3.44	5.50	8.93	0.45	**53.88**	5.19	8.31	13.50	0.45	**58.45**
775	1.727	3.65	5.84	9.49	0.48	**54.47**	5.52	8.83	14.35	0.48	**59.33**
800	1.782	3.87	6.19	10.07	0.51	**55.08**	5.85	9.36	15.22	0.51	**60.23**
825	1.838	4.10	6.56	10.66	0.54	**55.70**	6.20	9.91	16.11	0.54	**61.15**
850	1.894	4.33	6.93	11.26	0.58	**56.34**	6.55	10.48	17.03	0.58	**62.10**
875	1.950	4.57	7.31	11.88	0.61	**56.99**	6.91	11.06	17.97	0.61	**63.08**
900	2.005	4.82	7.70	12.52	0.65	**57.67**	7.28	11.65	18.93	0.65	**64.07**
925	2.061	5.07	8.11	13.17	0.68	**58.35**	7.66	12.25	19.91	0.68	**65.10**
950	2.117	5.32	8.52	13.84	0.72	**59.06**	8.05	12.87	20.92	0.72	**66.14**
975	2.172	5.59	8.94	14.52	0.76	**59.78**	8.44	13.51	21.95	0.76	**67.21**
1000	2.228	5.85	9.36	15.22	0.80	**60.52**	8.85	14.16	23.01	0.80	**68.30**

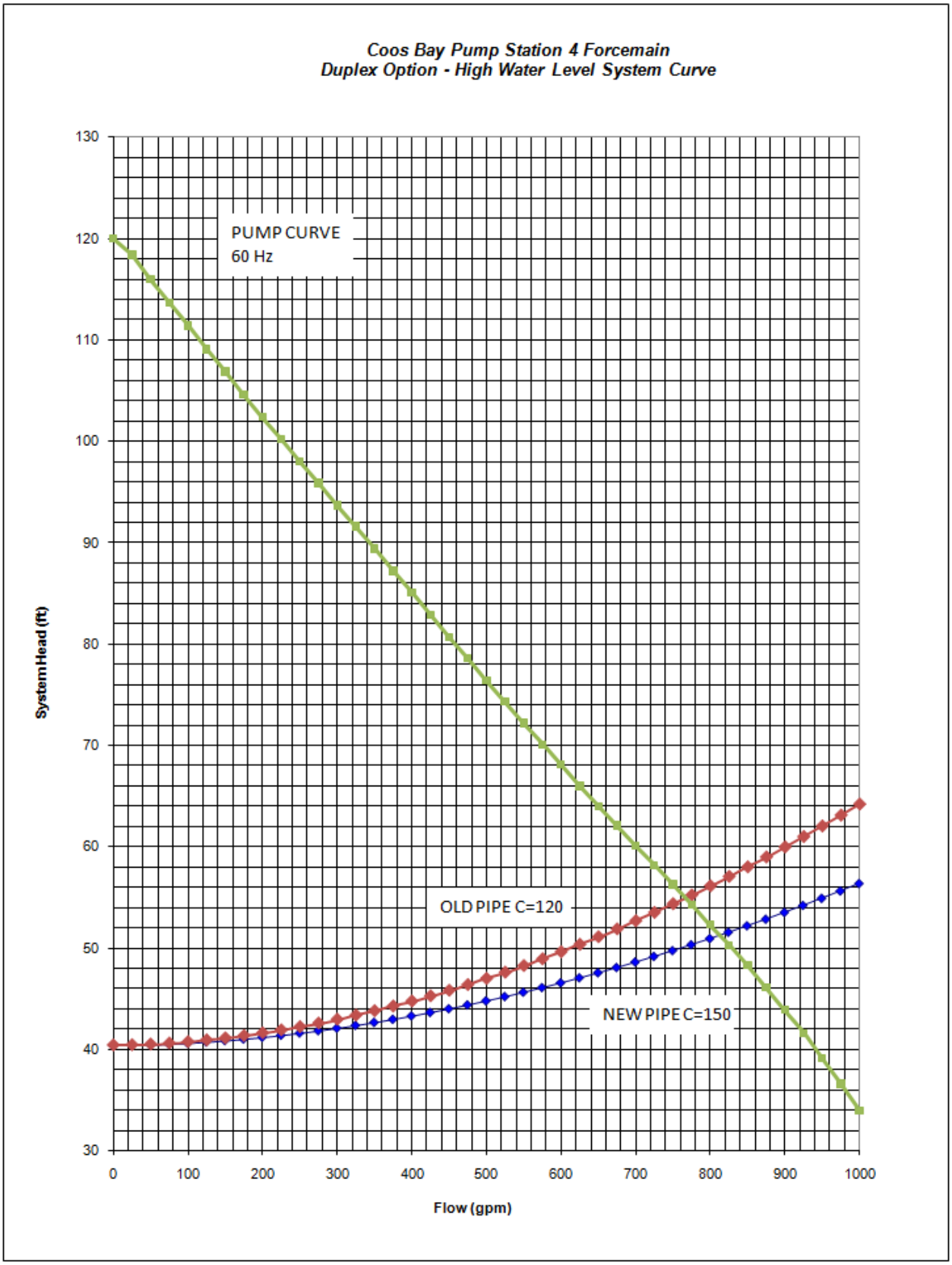


Figure 5.2.2b – System Head Curve – Duplex at High Water Level

Table 5.2.2b – System Head Calculations

Duplex Pump High Water Level System Head Curve											
Hazen-Williams Formula											
Input Data				Static Head =	40.4		High Water Wetw ell				
Pipe 1 Diameter (in) =		6.22	Pipe 2 Diameter (in) =		7.55	Pipe 1 Diameter (in) =		6.22	Pipe 2 Diameter (in) =		7.55
C =		150	C =		150	C =		120	C =		120
Pipe Length (ft) =		122.6	Pipe Length (ft) =		504	Pipe Length (ft) =		122.6	Pipe Length (ft) =		504
Area (ft^2) =		0.2110	Area (ft^2) =		0.3109	Area (ft^2) =		0.2110	Area (ft^2) =		0.3109
		New Pipe Dynamic Head					Old Pipe Dynamic Head				
Flow (gpm)	Flow (cfs)	$H1_{friction}$	$H2_{friction}$	$HT_{friction}$	$V^2/2g$ (pipe 3)	**HT**	$H1_{friction}$	$H2_{friction}$	$HT_{friction}$	$V^2/2g$ (pipe 3)	**HT**
0	0.000	0.00	0.00	0.00	0.00	**40.40**	0.00	0.00	0.00	0.00	**40.40**
25	0.056	0.01	0.01	0.02	0.00	**40.42**	0.01	0.02	0.02	0.00	**40.43**
50	0.111	0.02	0.04	0.06	0.00	**40.46**	0.03	0.06	0.09	0.00	**40.49**
75	0.167	0.05	0.08	0.13	0.00	**40.53**	0.07	0.12	0.19	0.00	**40.59**
100	0.223	0.08	0.13	0.21	0.01	**40.62**	0.12	0.20	0.32	0.01	**40.73**
125	0.279	0.12	0.20	0.32	0.01	**40.74**	0.19	0.30	0.49	0.01	**40.90**
150	0.334	0.17	0.28	0.45	0.02	**40.87**	0.26	0.42	0.69	0.02	**41.10**
175	0.390	0.23	0.37	0.60	0.02	**41.03**	0.35	0.56	0.91	0.02	**41.34**
200	0.446	0.30	0.48	0.77	0.03	**41.20**	0.45	0.72	1.17	0.03	**41.60**
225	0.501	0.37	0.59	0.96	0.04	**41.40**	0.56	0.89	1.45	0.04	**41.89**
250	0.557	0.45	0.72	1.17	0.05	**41.62**	0.68	1.09	1.77	0.05	**42.22**
275	0.613	0.54	0.86	1.39	0.06	**41.85**	0.81	1.30	2.11	0.06	**42.57**
300	0.668	0.63	1.01	1.64	0.07	**42.11**	0.95	1.52	2.47	0.07	**42.95**
325	0.724	0.73	1.17	1.90	0.08	**42.38**	1.10	1.77	2.87	0.08	**43.35**
350	0.780	0.84	1.34	2.18	0.10	**42.68**	1.27	2.03	3.29	0.10	**43.79**
375	0.836	0.95	1.52	2.47	0.11	**42.99**	1.44	2.30	3.74	0.11	**44.25**
400	0.891	1.07	1.72	2.79	0.13	**43.32**	1.62	2.59	4.22	0.13	**44.74**
425	0.947	1.20	1.92	3.12	0.14	**43.66**	1.81	2.90	4.72	0.14	**45.26**
450	1.003	1.33	2.13	3.47	0.16	**44.03**	2.02	3.23	5.24	0.16	**45.80**
475	1.058	1.47	2.36	3.83	0.18	**44.41**	2.23	3.57	5.80	0.18	**46.38**
500	1.114	1.62	2.59	4.22	0.20	**44.82**	2.45	3.92	6.37	0.20	**46.97**
525	1.170	1.77	2.84	4.61	0.22	**45.23**	2.68	4.29	6.98	0.22	**47.60**
550	1.225	1.93	3.09	5.03	0.24	**45.67**	2.92	4.68	7.60	0.24	**48.24**
575	1.281	2.10	3.36	5.46	0.26	**46.12**	3.18	5.08	8.26	0.26	**48.92**
600	1.337	2.27	3.64	5.91	0.29	**46.60**	3.44	5.50	8.93	0.29	**49.62**
625	1.393	2.45	3.92	6.37	0.31	**47.08**	3.71	5.93	9.63	0.31	**50.35**
650	1.448	2.64	4.22	6.85	0.34	**47.59**	3.99	6.37	10.36	0.34	**51.10**
675	1.504	2.83	4.52	7.35	0.36	**48.11**	4.27	6.84	11.11	0.36	**51.87**
700	1.560	3.02	4.84	7.86	0.39	**48.65**	4.57	7.31	11.88	0.39	**52.67**
725	1.615	3.23	5.16	8.39	0.42	**49.21**	4.88	7.80	12.68	0.42	**53.50**
750	1.671	3.44	5.50	8.93	0.45	**49.78**	5.19	8.31	13.50	0.45	**54.35**
775	1.727	3.65	5.84	9.49	0.48	**50.37**	5.52	8.83	14.35	0.48	**55.23**
800	1.782	3.87	6.19	10.07	0.51	**50.98**	5.85	9.36	15.22	0.51	**56.13**
825	1.838	4.10	6.56	10.66	0.54	**51.60**	6.20	9.91	16.11	0.54	**57.05**
850	1.894	4.33	6.93	11.26	0.58	**52.24**	6.55	10.48	17.03	0.58	**58.00**
875	1.950	4.57	7.31	11.88	0.61	**52.89**	6.91	11.06	17.97	0.61	**58.98**
900	2.005	4.82	7.70	12.52	0.65	**53.57**	7.28	11.65	18.93	0.65	**59.97**
925	2.061	5.07	8.11	13.17	0.68	**54.25**	7.66	12.25	19.91	0.68	**61.00**
950	2.117	5.32	8.52	13.84	0.72	**54.96**	8.05	12.87	20.92	0.72	**62.04**
975	2.172	5.59	8.94	14.52	0.76	**55.68**	8.44	13.51	21.95	0.76	**63.11**
1000	2.228	5.85	9.36	15.22	0.80	**56.42**	8.85	14.16	23.01	0.80	**64.20**

Based on the above system head curves, at the design flow rate of 700 gpm and high water level in the wetwell, the total dynamic head is expected to be between 48.65 and 52.67 feet for new and old pipe conditions, respectively. At the flow rate of 280 gpm necessary to maintain the minimum forcemain velocity of 2 ft/sec, the total dynamic head (TDH) is expected to be between 46.00 and 46.74 feet for new and old pipe conditions respectively.

5.2.3 Proposed Duplex Pumps

Pumps selected for use must be capable of producing the firm design capacity of 700 gpm under aged pipe conditions and also the minimum flow rate under new pipe conditions. For the proposed duplex lift station this requires a pump to be capable of pumping 700 gpm at 52.7 ft TDH at high water level in the wetwell and also capable of pumping 280 gpm at 46.7 ft TDH without dropping off the pump curve or overheating the motor.

Selection of pumps was performed using pump selection software provided by ITT Flygt (Flyps Version 3.1). Numerous pump, impeller and motor options were considered and analyzed. Pump options were also reviewed with Flygt application engineers to ensure that pump performance and motor turndown would be appropriate for the specific application.

The best option available for the conditions described above is the Flygt NP3153.091HT pump with a 263 mm (# 463) impeller and 20 horsepower motor. The pump performance curve generated using Flyps software is in Figure 5.2.3 on the following page. This pump is capable of turning down to approximately 280 gpm at 45.7 feet TDH. As can be seen on the performance curve, the design point is very close to these pumps best efficiency point (BEP).

This combination is the best fit for these operating conditions and this is the pump combination that Flygt would recommend for a duplex lift station operating at this design point.

The NP3153.091HT pump with 20 hp motor uses approximately 5.1 kilowatts (kW) while operating at the 280 gpm duty point, this equates to approximately 304.1 kW-hr per million gallons of water pumped. While operating at the 700 gpm duty point, this pump uses approximately 13.5 kW, which equates to approximately 319.2 kW-hr per million gallons of water pumped.

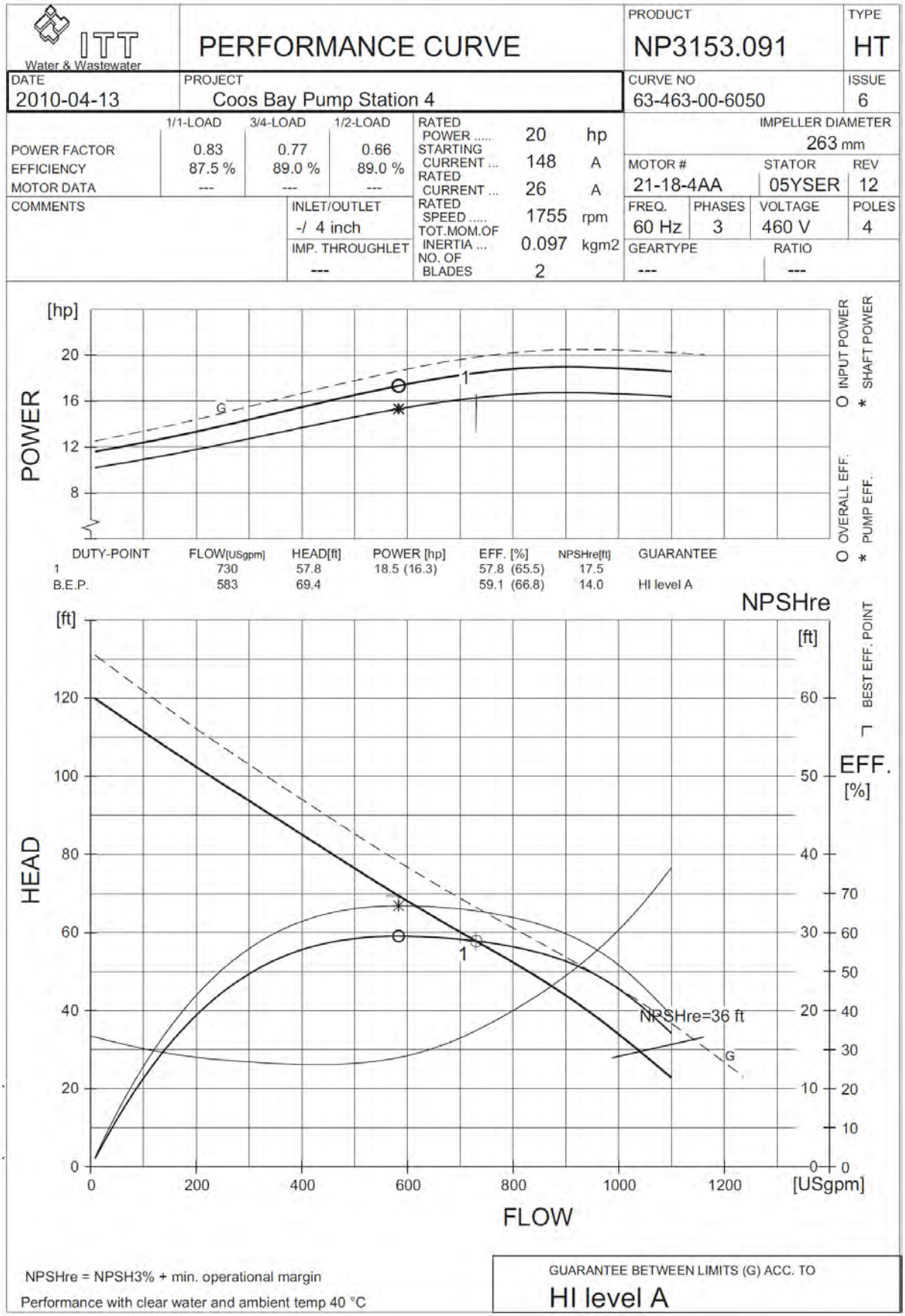


Figure 5.2.3 – Pump Performance Curve – Flygt NP3153.091HT

5.2.4 Net Positive Suction Head – Duplex Option

The net positive suction head (NPSH) is a function of atmospheric pressure, fluid properties, head losses within the suction pipe, and the vertical position of the pump relative to the water surface in the suction supply.

The pump curve supplied by the pump manufacturer indicates the NPSH required. This indicates the minimum NPSH required ($NPSH_{req}$) to avoid cavitation in the pump. The $NPSH_{req}$ indicated by the manufacturer is 17.5 feet at the design point.

To avoid cavitation the available NPSH ($NPSH_{avail}$) must be greater than the $NPSH_{req}$. The $NPSH_{avail}$ for pumps with flooded suction is determined by the following equation:

$$NPSH_{avail} = H_s + H_{atm} – P_v - h_L$$

H_s = Static suction head (to centerline of impeller) = 4.3 feet at high water level
H_{atm} = Atmospheric pressure = 14.7 psi at sea level = 33.9 feet
P_v = Vapor pressure of water at 59°F = 0.57 feet
h_L = Head loss in suction intake = 5.0 feet

Therefore $NPSH_{avail}$ = 4.3 ft + 33.9 ft – 0.57 ft – 5.0 ft = <u>32.63 feet</u>

The $NPSH_{avail}$ of 32.63 feet is significantly greater than the $NPSH_{req}$ of 17.5 feet indicated by the manufacturer.

5.3 *Lift Station <u>Triplex</u> Option*

Lift station option 2 is a triplex configuration with submersible centrifugal pumps as discussed above. This option would utilize three identically sized pumps capable of handling the projected peak design flow of 700 gpm with one pump out of service.

5.3.1 Wetwell Design and Detention Time

As discussed previously, the proposed wetwell would be 8-feet in diameter for triplex configurations. The sump area of an 8-foot diameter wetwell is determined by the equation $A = \pi r^2$ therefore $A = \pi(4\text{ ft})^2 = 50.3\text{ ft}^2$.

The wetwell volume must be adequate to prevent excessive pump starts. Manufacturers of submersible centrifugal pumps recommend a maximum of 10 starts per hour. For lift stations with more than two constant speed pumps, the minimum wetwell volume between low water level (LWL) and pump on level can be calculated using the following formula:

$$V_{required} = (V_{duplex}/n) + (n-1) \times h \times A$$

$V_{required}$ = Minimum volume in gallons
V_{duplex} = Minimum wetwell volume as determined in Section 5.2.1 = 140 ft^3
n = number of pumps in alternating cycle = 3
h = distance between lead and lag pump starts = 1.5 foot
A = Plan area of sump = 50.3 ft^2

Therefore: $V_{required} = (140\text{ ft}^3/3) + (3-1) \times 1.5\text{ foot} \times 50.3\text{ ft}^2 = 198\text{ ft}^3 = 1481$ gallons

This establishes the minimum wetwell volume to handle larger flows expected during wet weather conditions with one pump out of service. Based on this calculation, it is determined that the high water level (HWL) should be a minimum of 3.93 feet above the LWL to ensure a maximum of 10 pump starts per hour. When the water level reaches the HWL, two pumps should ramp up to a combined capacity of 700 gpm. This calculation establishes a minimum acceptable wetwell volume; operational considerations may dictate a larger wetwell volume. A more detailed pump start/stop operation strategy will be developed in Section 8.1.

However, during dry weather conditions it is important to avoid long detention time in the wetwell leading to septic conditions. In general, average detention time should be no more than 35 minutes during average flow conditions during July, August and September. The average maximum wetwell volume required to avoid septic conditions can be calculated as follows:

$V_{wetwell} = Q_{summer}$ x 35 minutes

$V_{wetwell}$ = Maximum wetwell volume to avoid septic conditions
Q_{summer} = Summer base flow during July – September = 38 gpm

Therefore: $V_{wetwell}$ = 38 gpm x 35 minutes = 1,330 gallons (178 ft^3)

Based on this calculation it is determined that the lead pump start elevation should be about 3.53 feet above LWL. Since the wetwell detention requires a smaller volume, the two pumps will alternatively be started at lower levels and require a more shallow wetwell. At this initial start elevation, the pump should ramp up to the minimum speed of 3.5 ft/sec (500 gpm) required to re-suspend solids and then ramp down to 2 ft/sec (280 gpm) minimum velocity. The lag pump start level should be at least 1.5 feet above the lead pump start level to avoid unnecessary pump starts. A summary of minimum pump start and stop levels is provided in the table below:

Table 5.3.1 – Minimum Pump Start/Stop Levels

Point Description	Level Above Bottom of Wetwell	Water Surface Elevation
LWL (Pumps Off)	1.5 ft	-6.5 ft
Lead Pump Start	4.0 ft	-4.0 ft
Lag Pump Start (HWL)	5.5 ft	-2.5 ft

Based on this proposed LWL and HWL the total wetwell volume would be 201 ft^3 (1,500 gallons), which is greater than the minimum required volume to prevent excessive pump starts. The volume between LWL and Lead Pump Start level is 126 ft^3 which is approximately 25 minutes of dry weather detention.

5.3.2 System Head

System head curves for the triplex lift station configuration (Option 2) have been developed for both high and low wet well levels. It is assumed that during dry weather base flow, one pump will run at reduced a flow rate of 490 gpm for a short period of time to re-suspend solids in the forcemain and then ramp down to a flow rate of 280 gpm. The minimum flow rate of 280 gpm will be maintained until water reaches the LWL and the pump shuts off. However, when water levels reach the lag pump start level, a second pump will ramp up to combined flow rate of 700 gpm and will maintain this rate until levels reach the lag pump start point. When the water level drops to the lag pump start point, then the pump rate can ramp down to a reduced flow rate.

Based on this operating strategy, the maximum flow rate of 700 gpm will occur at a water surface elevation of -2.5 feet or greater. Similarly, at the lowest water surface elevation of -6.5 feet, the pumping

rate will be approximately 280 gpm. System head curves will be based on these operational assumptions.

System head calculations include an equivalent pipe length of 87.8 ft of 6" piping and 45.5f t of 8" forcemain piping to account for minor losses through fittings and transitions.

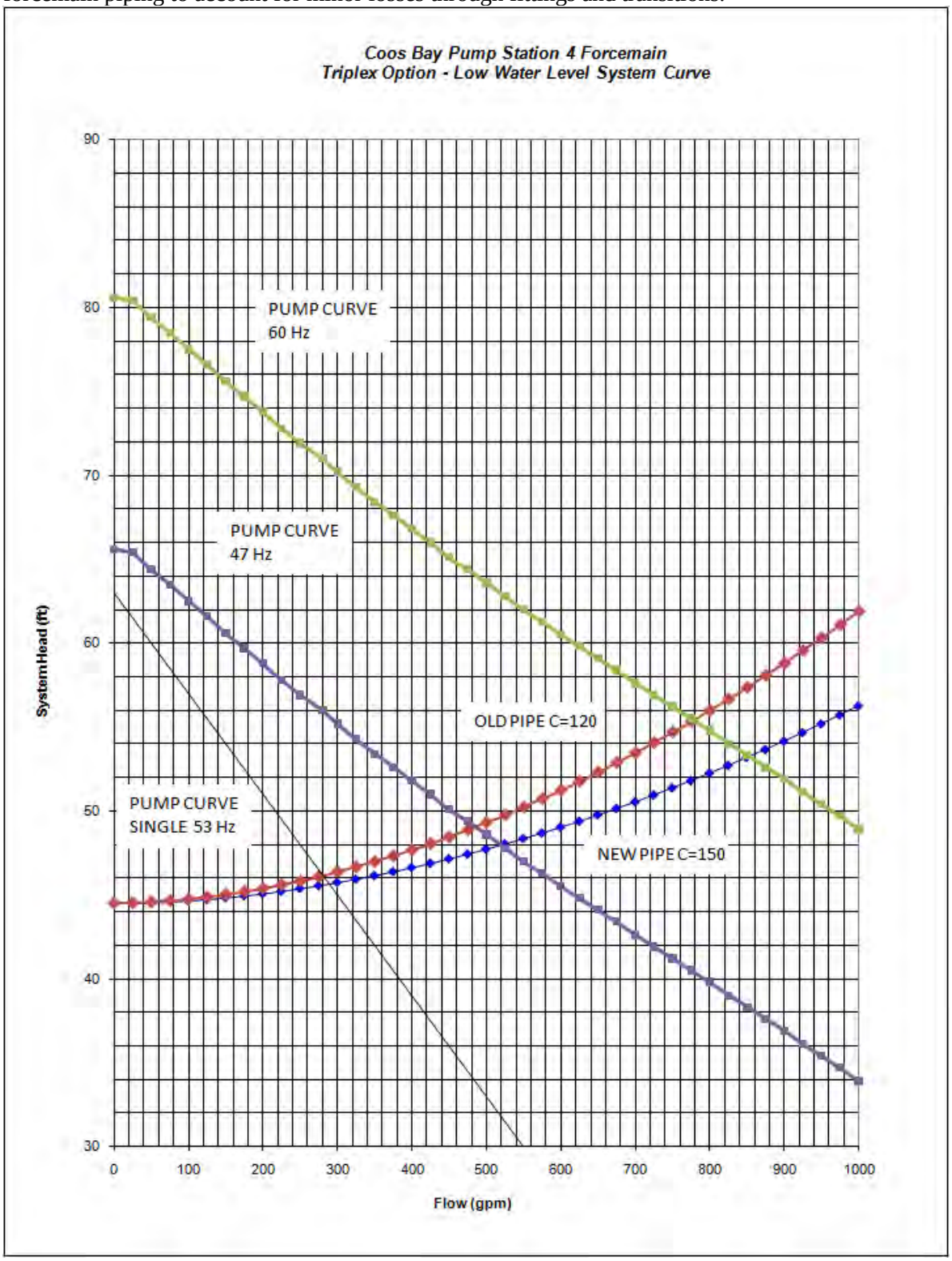


Figure 5.3.2a – System Head Curve – Triplex at Low Water Level

Table 5.3.2a – System Curve Calculations – 2 Pumps Running

Triplex Pump Low Water Level System Head Curve											
Hazen-Williams Formula											
Input Data				Static Head =	44.5		Low Water Wetw ell				
Pipe 1 Diameter (in) =		6.22	Pipe 2 Diameter (in) =		7.55	Pipe 1 Diameter (in) =		6.22	Pipe 2 Diameter (in) =		7.55
C =		150	C =		150	C =		120	C =		120
Pipe Length (ft) =		122.6	Pipe Length (ft) =		504	Pipe Length (ft) =		122.6	Pipe Length (ft) =		504
Area (ft^2) =		0.2110	Area (ft^2) =		0.3109	Area (ft^2) =		0.2110	Area (ft^2) =		0.3109
		New Pipe Dynamic Head					**Old Pipe Dynamic Head**				
Flow (gpm)	Flow (cfs)	$H1_{friction}$	$H2_{friction}$	$HT_{friction}$	$V^2/2g$ (pipe 3)	**HT**	$H1_{friction}$	$H2_{friction}$	$HT_{friction}$	$V^2/2g$ (pipe 3)	**HT**
0	0.000	0.00	0.00	0.00	0.00	**44.50**	0.00	0.00	0.00	0.00	**44.50**
25	0.056	0.00	0.01	0.01	0.00	**44.51**	0.00	0.02	0.02	0.00	**44.52**
50	0.111	0.01	0.04	0.04	0.00	**44.54**	0.01	0.06	0.06	0.00	**44.57**
75	0.167	0.01	0.08	0.09	0.00	**44.60**	0.02	0.12	0.14	0.00	**44.64**
100	0.223	0.02	0.13	0.15	0.01	**44.66**	0.03	0.20	0.23	0.01	**44.74**
125	0.279	0.03	0.20	0.23	0.01	**44.75**	0.05	0.30	0.35	0.01	**44.87**
150	0.334	0.05	0.28	0.33	0.02	**44.85**	0.07	0.42	0.49	0.02	**45.01**
175	0.390	0.06	0.37	0.44	0.02	**44.96**	0.10	0.56	0.66	0.02	**45.18**
200	0.446	0.08	0.48	0.56	0.03	**45.09**	0.12	0.72	0.84	0.03	**45.37**
225	0.501	0.10	0.59	0.69	0.04	**45.23**	0.15	0.89	1.05	0.04	**45.59**
250	0.557	0.12	0.72	0.84	0.05	**45.39**	0.19	1.09	1.27	0.05	**45.82**
280	0.624	0.15	0.89	1.04	0.06	**45.60**	0.23	1.34	1.57	0.06	**46.13**
300	0.668	0.17	1.01	1.18	0.07	**45.75**	0.26	1.52	1.79	0.07	**46.36**
325	0.724	0.20	1.17	1.37	0.08	**45.95**	0.31	1.77	2.07	0.08	**46.66**
350	0.780	0.23	1.34	1.57	0.10	**46.17**	0.35	2.03	2.38	0.10	**46.97**
375	0.836	0.26	1.52	1.79	0.11	**46.40**	0.40	2.30	2.70	0.11	**47.31**
400	0.891	0.30	1.72	2.01	0.13	**46.64**	0.45	2.59	3.04	0.13	**47.67**
425	0.947	0.33	1.92	2.25	0.14	**46.90**	0.50	2.90	3.40	0.14	**48.05**
450	1.003	0.37	2.13	2.50	0.16	**47.17**	0.56	3.23	3.79	0.16	**48.45**
475	1.058	0.41	2.36	2.77	0.18	**47.45**	0.62	3.57	4.18	0.18	**48.86**
500	1.114	0.45	2.59	3.04	0.20	**47.74**	0.68	3.92	4.60	0.20	**49.30**
525	1.170	0.49	2.84	3.33	0.22	**48.05**	0.74	4.29	5.04	0.22	**49.76**
550	1.225	0.54	3.09	3.63	0.24	**48.37**	0.81	4.68	5.49	0.24	**50.23**
575	1.281	0.58	3.36	3.94	0.26	**48.71**	0.88	5.08	5.96	0.26	**50.72**
600	1.337	0.63	3.64	4.27	0.29	**49.05**	0.95	5.50	6.45	0.29	**51.24**
625	1.393	0.68	3.92	4.60	0.31	**49.41**	1.03	5.93	6.95	0.31	**51.77**
650	1.448	0.73	4.22	4.95	0.34	**49.78**	1.10	6.37	7.48	0.34	**52.32**
675	1.504	0.78	4.52	5.31	0.36	**50.17**	1.18	6.84	8.02	0.36	**52.88**
700	1.560	0.84	4.84	5.68	0.39	**50.57**	1.27	7.31	8.58	0.39	**53.47**
725	1.615	0.89	5.16	6.06	0.42	**50.98**	1.35	7.80	9.16	0.42	**54.07**
750	1.671	0.95	5.50	6.45	0.45	**51.40**	1.44	8.31	9.75	0.45	**54.70**
775	1.727	1.01	5.84	6.85	0.48	**51.83**	1.53	8.83	10.36	0.48	**55.34**
800	1.782	1.07	6.19	7.27	0.51	**52.28**	1.62	9.36	10.99	0.51	**56.00**
825	1.838	1.14	6.56	7.69	0.54	**52.74**	1.72	9.91	11.63	0.54	**56.67**
850	1.894	1.20	6.93	8.13	0.58	**53.21**	1.81	10.48	12.29	0.58	**57.37**
875	1.950	1.27	7.31	8.58	0.61	**53.69**	1.91	11.06	12.97	0.61	**58.08**
900	2.005	1.33	7.70	9.04	0.65	**54.18**	2.02	11.65	13.66	0.65	**58.81**
925	2.061	1.40	8.11	9.51	0.68	**54.69**	2.12	12.25	14.38	0.68	**59.56**
950	2.117	1.47	8.52	9.99	0.72	**55.21**	2.23	12.87	15.10	0.72	**60.32**
975	2.172	1.55	8.94	10.48	0.76	**55.74**	2.34	13.51	15.85	0.76	**61.11**
1000	2.228	1.62	9.36	10.99	0.80	**56.28**	2.45	14.16	16.61	0.80	**61.91**

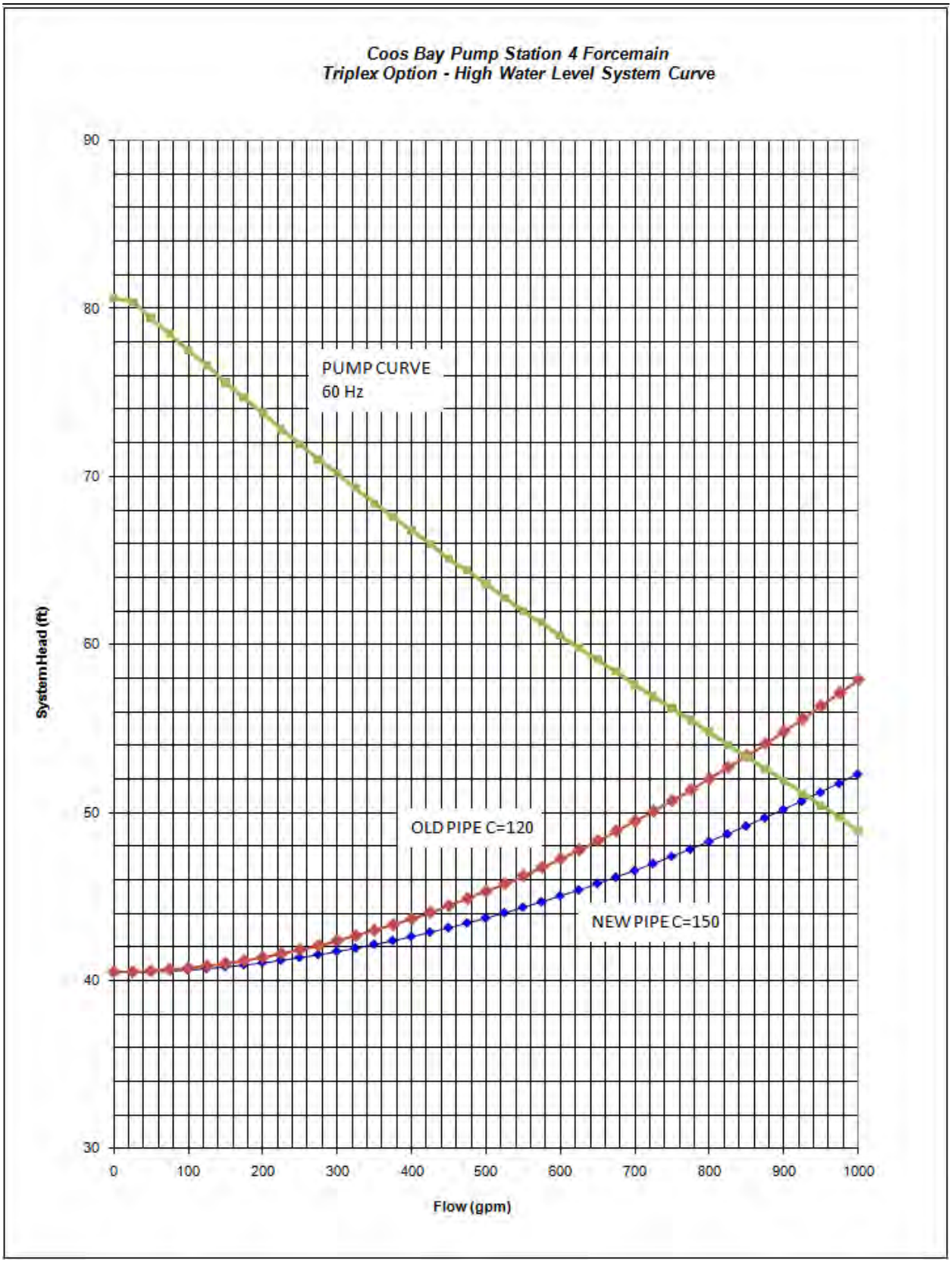


Figure 5.3.2b – System Head Curve – Triplex at High Water Level.

Table 5.3.2b – System Curve Calculations – 2 Pumps Running

Triplex Pump High Water Level System Head Curve											
Hazen-Williams Formula											
Input Data				Static Head =	40.5		High Water Wetw ell				
Pipe 1 Diameter (in) =		6.22	Pipe 2 Diameter (in) =		7.55	Pipe 1 Diameter (in) =		6.22	Pipe 2 Diameter (in) =		7.55
C =		150	C =		150	C =		120	C =		120
Pipe Length (ft) =		122.6	Pipe Length (ft) =		504	Pipe Length (ft) =		122.6	Pipe Length (ft) =		504
Area (ft^2) =		0.2110	Area (ft^2) =		0.3109	Area (ft^2) =		0.2110	Area (ft^2) =		0.3109
		New Pipe Dynamic Head					**Old Pipe Dynamic Head**				
Flow (gpm)	Flow (cfs)	$H1_{friction}$	$H2_{friction}$	$HT_{friction}$	$V^2/2g$ (pipe 3)	**HT**	$H1_{friction}$	$H2_{friction}$	$HT_{friction}$	$V^2/2g$ (pipe 3)	**HT**
0	0.000	0.00	0.00	0.00	0.00	**40.50**	0.00	0.00	0.00	0.00	**40.50**
25	0.056	0.00	0.01	0.01	0.00	**40.51**	0.00	0.02	0.02	0.00	**40.52**
50	0.111	0.01	0.04	0.04	0.00	**40.54**	0.01	0.06	0.06	0.00	**40.57**
75	0.167	0.01	0.08	0.09	0.00	**40.60**	0.02	0.12	0.14	0.00	**40.64**
100	0.223	0.02	0.13	0.15	0.01	**40.66**	0.03	0.20	0.23	0.01	**40.74**
125	0.279	0.03	0.20	0.23	0.01	**40.75**	0.05	0.30	0.35	0.01	**40.87**
150	0.334	0.05	0.28	0.33	0.02	**40.85**	0.07	0.42	0.49	0.02	**41.01**
175	0.390	0.06	0.37	0.44	0.02	**40.96**	0.10	0.56	0.66	0.02	**41.18**
200	0.446	0.08	0.48	0.56	0.03	**41.09**	0.12	0.72	0.84	0.03	**41.37**
225	0.501	0.10	0.59	0.69	0.04	**41.23**	0.15	0.89	1.05	0.04	**41.59**
250	0.557	0.12	0.72	0.84	0.05	**41.39**	0.19	1.09	1.27	0.05	**41.82**
275	0.613	0.15	0.86	1.01	0.06	**41.57**	0.22	1.30	1.52	0.06	**42.08**
300	0.668	0.17	1.01	1.18	0.07	**41.75**	0.26	1.52	1.79	0.07	**42.36**
325	0.724	0.20	1.17	1.37	0.08	**41.95**	0.31	1.77	2.07	0.08	**42.66**
350	0.780	0.23	1.34	1.57	0.10	**42.17**	0.35	2.03	2.38	0.10	**42.97**
375	0.836	0.26	1.52	1.79	0.11	**42.40**	0.40	2.30	2.70	0.11	**43.31**
400	0.891	0.30	1.72	2.01	0.13	**42.64**	0.45	2.59	3.04	0.13	**43.67**
425	0.947	0.33	1.92	2.25	0.14	**42.90**	0.50	2.90	3.40	0.14	**44.05**
450	1.003	0.37	2.13	2.50	0.16	**43.17**	0.56	3.23	3.79	0.16	**44.45**
475	1.058	0.41	2.36	2.77	0.18	**43.45**	0.62	3.57	4.18	0.18	**44.86**
500	1.114	0.45	2.59	3.04	0.20	**43.74**	0.68	3.92	4.60	0.20	**45.30**
525	1.170	0.49	2.84	3.33	0.22	**44.05**	0.74	4.29	5.04	0.22	**45.76**
550	1.225	0.54	3.09	3.63	0.24	**44.37**	0.81	4.68	5.49	0.24	**46.23**
575	1.281	0.58	3.36	3.94	0.26	**44.71**	0.88	5.08	5.96	0.26	**46.72**
600	1.337	0.63	3.64	4.27	0.29	**45.05**	0.95	5.50	6.45	0.29	**47.24**
625	1.393	0.68	3.92	4.60	0.31	**45.41**	1.03	5.93	6.95	0.31	**47.77**
650	1.448	0.73	4.22	4.95	0.34	**45.78**	1.10	6.37	7.48	0.34	**48.32**
675	1.504	0.78	4.52	5.31	0.36	**46.17**	1.18	6.84	8.02	0.36	**48.88**
700	1.560	0.84	4.84	5.68	0.39	**46.57**	1.27	7.31	8.58	0.39	**49.47**
725	1.615	0.89	5.16	6.06	0.42	**46.98**	1.35	7.80	9.16	0.42	**50.07**
750	1.671	0.95	5.50	6.45	0.45	**47.40**	1.44	8.31	9.75	0.45	**50.70**
775	1.727	1.01	5.84	6.85	0.48	**47.83**	1.53	8.83	10.36	0.48	**51.34**
800	1.782	1.07	6.19	7.27	0.51	**48.28**	1.62	9.36	10.99	0.51	**52.00**
825	1.838	1.14	6.56	7.69	0.54	**48.74**	1.72	9.91	11.63	0.54	**52.67**
850	1.894	1.20	6.93	8.13	0.58	**49.21**	1.81	10.48	12.29	0.58	**53.37**
875	1.950	1.27	7.31	8.58	0.61	**49.69**	1.91	11.06	12.97	0.61	**54.08**
900	2.005	1.33	7.70	9.04	0.65	**50.18**	2.02	11.65	13.66	0.65	**54.81**
925	2.061	1.40	8.11	9.51	0.68	**50.69**	2.12	12.25	14.38	0.68	**55.56**
950	2.117	1.47	8.52	9.99	0.72	**51.21**	2.23	12.87	15.10	0.72	**56.32**
975	2.172	1.55	8.94	10.48	0.76	**51.74**	2.34	13.51	15.85	0.76	**57.11**
1000	2.228	1.62	9.36	10.99	0.80	**52.28**	2.45	14.16	16.61	0.80	**57.91**

Based on the above system head curves, at the design flow rate of 700 gpm and high water level in the wetwell, the total dynamic head is expected to be between 46.57 and 49.47 feet for new and old pipe conditions, respectively. At the flow rate of 280 gpm necessary to maintain the minimum forcemain velocity of 2 ft/sec, the total dynamic head (TDH) is expected to be between 45.60 and 46.13 feet for new and old pipe conditions respectively.

5.3.3 Proposed Triplex Pumps

Pumps selected for use must be capable of producing the firm design capacity of 700 gpm under aged pipe conditions and also the minimum flow rate under new pipe conditions. The proposed triplex lift station requires two pumps capable of pumping 700 gpm at 49.5 ft TDH while running simultaneously. The minimum flow of 280 gpm at 46.1 ft TDH must be achieved with one pump running, without dropping off the pump curve or overheating the motor.

Selection of pumps was performed using pump selection software provided by ITT Flygt (Flyps Version 3.1). Numerous pump, impeller and motor options were considered and analyzed. Pump options were also reviewed with Flygt application engineers to ensure that pump performance and motor turndown would be appropriate for the specific application.

The best option available for the conditions described above is the Flygt NP3127.095HT pump with a 215 mm (#488) impeller and 10 horsepower motor. The pump performance curve generated using Flyps software is in Figure 5.2.3 on the following page. This pump is capable of turning down to approximately 280 gpm at 46.5 feet TDH. As can be seen on the performance curve, the design point is slightly below the best efficiency point at both 700 gpm and 280 gpm (BEP).

The NP3127.095HT pump with 10 hp motor uses approximately 7.0 kilowatts (kW) while operating at the 280 gpm duty point, this equates to approximately 420.0 kW-hr per million gallons of water pumped. While operating at the 700 gpm duty point, two pumps combined use approximately 14.4 kW, which equates to approximately 330.3 kW-hr per million gallons of water pumped.

As previously discussed, the Triplex Option will use three equally sized pumps; two pumps running simultaneously will achieve the 700 gpm firm pumping rate. The proposed pumps will be capable of achieving the design rate while running at approximately 56 Hz, which will allow the station to pump up to 700 gpm, with two pumps running. Dry weather flows will be met with one pump. The pumps and motors are non-overloading over the entire pump curve.

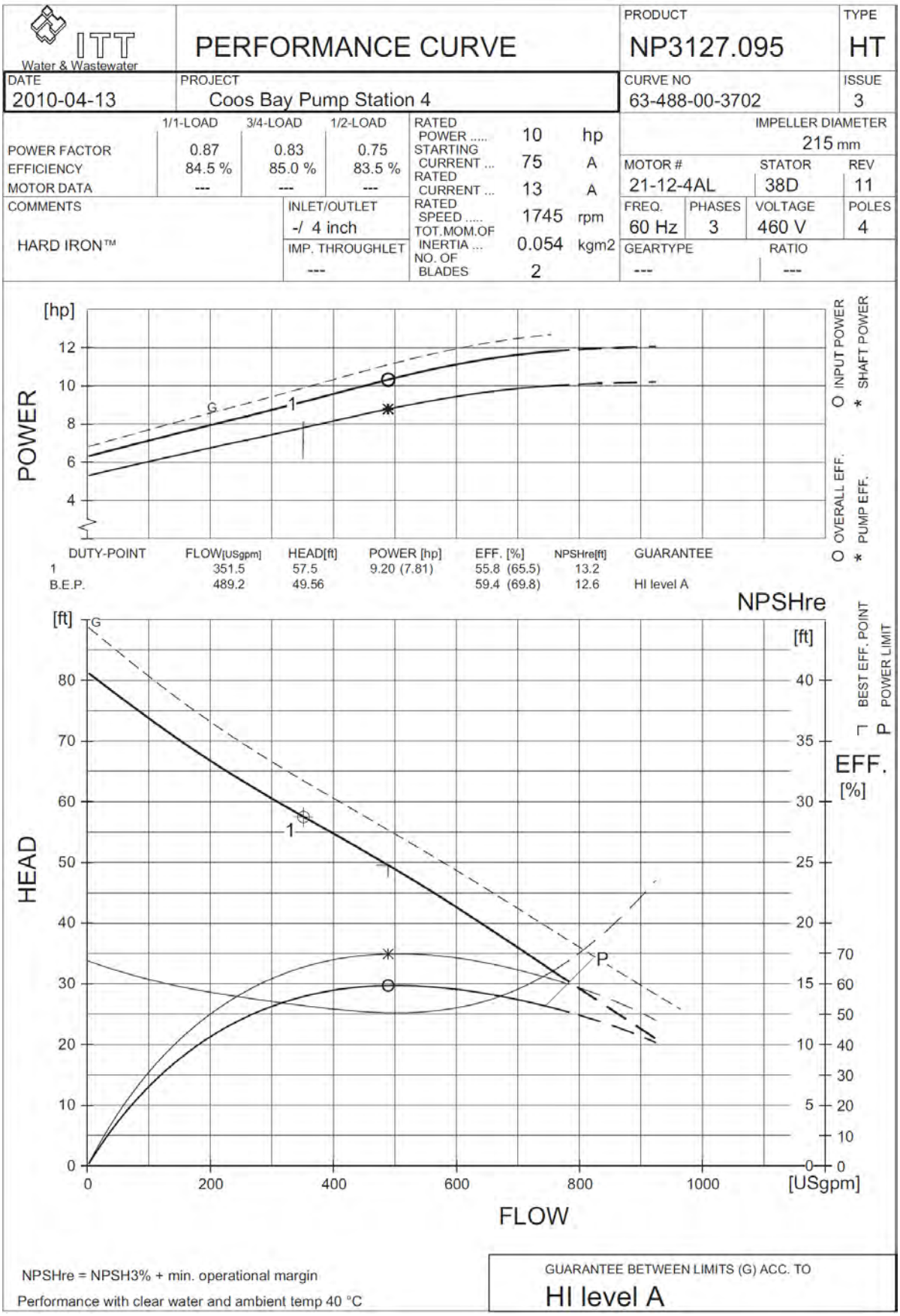


Figure 5.3.3 – Pump Performance Curve – Flygt NP3153.091HT

5.3.4 Net Positive Suction Head – Triplex Option

The net positive suction head (NPSH) is a function of atmospheric pressure, fluid properties, head losses within the suction pipe, and the vertical position of the pump relative to the water surface in the suction supply.

The pump curve supplied by the pump manufacturer indicates the NPSH required. This indicates the minimum NPSH required ($NPSH_{req}$) to avoid cavitation in the pump. The $NPSH_{req}$ indicated by the manufacturer is 13.2 feet at the design point.

To avoid cavitation the available NPSH ($NPSH_{avail}$) must be greater than the $NPSH_{req}$. The $NPSH_{avail}$ for pumps with flooded suction is determined by the following equation:

$$NPSH_{avail} = H_s + H_{atm} – P_v - h_L$$

H_s = Static suction head (to centerline of impeller) = 3.2 feet at pump start
H_{atm} = Atmospheric pressure = 14.7 psi at sea level = 33.9 feet
P_v = Vapor pressure of water at 59°F = 0.57 feet
h_L = Head loss in suction intake = 5.0 feet

Therefore $NPSH_{avail}$ = 3.2 ft + 33.9 ft – 0.57 ft – 5.0 ft = 31.53 feet

The $NPSH_{avail}$ of 31.53 feet is significantly greater than the $NPSH_{req}$ of 13.2 feet indicated by the manufacturer.

5.4 Comparison of Duplex and Triplex Options

Both the duplex and triplex pumping options are able to meet the peak design point of 700 gpm while providing full redundancy in accordance with DEQ requirements, although the duplex pumps are close to overloading at the peak design point. The triplex option will be capable of exceeding the peak design point under old pipe conditions while operation at approximately 56 Hz, with a safety margin. The Duplex option will achieve peak design flow at approximately 58 Hz with a margin of safety. Both options are non-overloading at the peak design point. If a greater margin of safety is desired on the triplex option, a 3127.095 with a 155mm (#243) impeller would run less efficiently at the design point.

Capital and operating costs for the duplex and triplex options are discussed below.

5.4.1 Capital Costs

The duplex lift station option would use two Flygt NP3153.091pumps with 20 HP motors, each capable of pumping 700 gpm. The budgetary cost estimate from Flygt for these pumps is $12,100 each, and $7410 each for an ABB VFD, for a total of $39,020 for the proposed duplex option.

The triplex lift station option would use three Flygt NP3127.095 pumps with 10 HP motors, capable of pumping 700 gpm with two pumps running. The budgetary cost estimate from Flygt for these pumps is $6,164 each, and $5753 each for an ABB VFD, for a total of $38,151 for the proposed triplex option.

Wetwell, piping, valves and installation costs are increased with the Triplex Option. A third valve, header pipe and discharge pipe as well as connecting wye are required with the Triplex Option. These costs add approximately $6200 to the price.

Therefore, the upfront capital costs of pumping equipment are slightly higher for the Triplex Option.

5.4.2 Operation Costs

The energy used to pump at the minimum flow rate with of 280 gpm with the Duplex Option would be 5.1 kilowatt (kW), or 304.1 kilowatt-hours per million gallons of water pumped (kW-hr/MG). The energy used to pump 280 gpm with the Triplex Option would be 7.0 kW, or 420.0 kW-hr/MG. The smaller pumps used in the Triplex Option less more efficient at the operating point and use 115.9 kW-hr/MG more than the Duplex option at the same operating point. The approximate pumping cost difference at $0.07 per kW-hr would be $8.11 per million gallons of water pumped.

The energy used to pump at the peak design point of 700 gpm with the Duplex Option would be 13.5 kW, or 319.2 kW-hr/MG. The energy used to pump 700 gpm with the Triplex Option would be 14.4 kW, or 330.3 kW-hr/MG. In this case, the Triplex Option would use 11.1 kW-hr/MG more than the Duplex Option at the peak design operation point. The approximate pumping cost difference at $0.07 per kW-hr would be $0.77 per million gallons of water pumped.

This operational cost analysis indicates a substantial difference in energy use between the proposed duplex and triplex options. The actual dollar cost difference in operating between the duplex and triplex options would be practically negligible. According to flow data the average daily flow is approximately 0.126 MGD. That equates to a total yearly volume at the lift station of approximately 46.1 million gallons, creating a maximum pumping cost difference of about $374 per year between the Duplex and Triplex options. Annual operating costs for the higher Triplex option are $1355 per year and do not amount to a large portion of the overall price.

Over the life of the lift station, the Triplex Option pump maintenance will be somewhat less expensive to operate and maintain by reducing the runtime of each pump by splitting total runtime over three pumps, rather than just two pumps. This should extend pump and component life of the Triplex Option by approximately 20% when compared to the Duplex Option.

5.5 *Pumping Recommendation – Duplex Option*

Capital and operational costs of the Duplex Option are both lower than for the Triplex Option but are small in comparison to the completed lift station cost. The Duplex option requires a smaller wetwell, valve vault, less connecting piping and is more energy efficient. The Triplex option offers advantages of greater pump life over the Duplex Option. Because the site must be elevated above the 100 year flood plain, the required retaining wall and associated structures setbacks reduce the allotted space for the wetwell, vault, generator, and control building, therefore favoring the smaller Duplex Option. Both options are capable of meeting all the design requirements. These two options have also been discussed with a Flygt application engineer and it is the opinion of Flygt that the duplex option is a better fit for this application.

Based on the analysis and considerations discussed above, the Duplex Option is recommended for the Pump Station 4 Lift Station.

6.0 Design Considerations

Other design considerations common to both lift station options will be evaluated in this Section.

6.1 *Forcemain Detention Time*

During dry weather periods when flows to the pump station are low, long anaerobic detention times within the forcemain can lead to the development of high concentrations of dissolved hydrogen sulfide (H_2S) gas. Hydrogen sulfide in high concentrations is corrosive to concrete pipes and manholes downstream of the forcemain. DEQ standards recommend hydrogen sulfide control or mitigation for all lift stations where anaerobic detention time in the forcemain averages more than 35 minutes during low-flow periods. Detention time is calculated as the volume of the forcemain divided by the average daily flow rate to the lift station in July, August and September.

Based on flow monitoring data, the average projected daily flow is 55,300 gallons per day, or approximately 38 gpm, for the months of July, August and September. Therefore, detention time in the forcemain will be determined as follows:

$$T_{det} = FM_{volume} / Q_{dry}$$

Where:

T_{det} = Detention time in the forcemain
FM_{volume} = Forcemain volume = $\pi(0.6291 \text{ ft}/2)^2 \times 480 \text{ ft} = 149 \text{ ft}^3 = 1{,}116$ gallons
Q_{dry} = Dry weather flow = 38 gpm

Therefore:

$$T_{det} = FM_{volume} / Q_{dry} = 1{,}116 \text{ gallons} / 38 \text{ gpm} = 29.4 \text{ minutes}$$

Detention time in the proposed forcemain will be under 35 minutes, therefore H_2S control is not needed to address H_2S occurring from long detention times.

6.2 *Hydrogen Sulfide Controls (*)*

Corrosion to the discharge manhole is occurring, therefore H_2S control or mitigation may be required. A two-level approach to controls is being taken. According to Oregon Standard for Design and Construction of Wastewater Pump Stations, H_2S is not required when detention times are under 35 minutes. The proposed pump station meets those guidelines. The current pump station also meets those guidelines; although no past flow records are available to verify detention times have always been short.

- Level 1 will be to protect the discharge manhole as a precaution.
- Level 2 will be to perform a chemical H_2S test this summer. If tests indicate high H_2S levels during short detention times, more advanced controls will be used.

DEQ recommends several options for H_2S controls. Each option will be discussed below. This detention time is based on current summer base flows. If development occurs in the Pump Station 4 basin, the summer base flows will increase and detention time will decrease.

**(Subsequent to the draft report H_2S testing found no detectable H_2S at the forcemain, Level 1 to be used)*

6.2.1 Backdrainage

One option recommended by DEQ for controlling the formation of H_2S is to drain the entire forcemain volume back into the wetwell to eliminate detention of raw sewage in the forcemain. This option would require the wetwell to be large enough to hold the forcemain volume in addition to the expected inflow. This option would also require sewage to be pumped multiple times and would significantly increase the cost of operating the lift station. This option would also significantly increase the pump runtimes and would decrease the expected life of the pumps. For these reasons backdrainage is not considered a viable option in this instance.

6.2.2 Air Injection – Recommended Level 2

Continuous air injection into the forcemain will prevent anaerobic conditions from developing and will prevent H_2S production. Air injection requires pumps to be sized to pump against the increased pressure caused by the air injection. In systems with air injection, the static head that the pumps work against must be calculated as the sum of all ascending segments of the forcemain.

Air injection requires an air compressor, receiver, and controls to be installed to inject air at the low point of the forcemain. The compressor and controls must be installed in a building to protect equipment. The point of injection must be at the low point of the forcemain to allow injected air to migrate up through the pipe to aerate the stored volume of the forcemain. The air compressor and control building must be located within a reasonable distance, typically less than 200 feet, from the injection point to avoid excessive pressure drop through the air supply pipe. Access via manhole or vault should be available to the injection point to allow for maintenance and repair of the injection tap and quill.

In this case, the proposed forcemain will descend from the valve vault until the end of the right of way. If high H_2S concentrations are still occurring this summer, it is proposed to install a manhole and injection nozzle at the forcemain low point supplied from a buried air line from the control room compressor. The forcemain constantly ascends from that point and allows aeration up till the discharge manhole. The compressor would be required to supply 16 scfm of airflow (8 in diameter X 2 scfm) at 13.2psi.

6.2.3 Chemical Control

DEQ Standards state that where an air injection or backdrainage system is impractical or undesirable, chemical alternatives must be considered. Chemical controls may include solution feed systems for calcium nitrate, hydrogen peroxide, hypochlorite, or potassium permanganate. DEQ Standards further state that chemical feed systems shall be designed for continuous feed to maintain the H_2S concentration of the forcemain discharge below 0.1 mg/L at all times. Chemical feed systems are required to meet EPA Class I reliability with respect to component redundancy, standby power, and failure alarms.

Chemical control systems for H_2S production have some inherent drawbacks. The systems will either require significant operational attention in the case of simple feed systems using commercially produced chemicals, or will have significant capital cost in the case of an on-site generation system (sodium hypochlorite). Chemical dosing to effectively control H_2S production depends on the specific wastewater characteristics. Data on the wastewater characteristics at the lift station is not available at this time and therefore specific sizing for a chemical treatment system is not possible.

General chemical treatment recommendations are available for control of H_2S production using sodium hypochlorite solution. Treatment recommendations obtained from on-site hypochlorite generation equipment suggest a dose of about 6 mg/L for domestic wastewater to achieve a free chlorine residual of 1 mg/L. Chemical feed would be injected into the forcemain during summer months when inflow into the wetwell is low enough to create long detention times in the forcemain. Chemical injection equipment

must be able to feed at a rate appropriate for the base effluent flow rate produced by the lift station, in this case 280 gpm. Based on an approximate feed rate of 6 mg/L, a hypochlorite generator of approximately 20 to 25 pounds per day (ppd) would be required.

The addition of an on-site hypochlorite generation system will require a building to house the generation equipment, brine tanks, hypochlorite tank, hydrogen dilution blower and metering pump. Space will be required for bulk salt storage. Additional property will have to be purchased to accommodate the extra facilities. The use of chemical feed for hydrogen sulfide control will also require additional labor to operate and maintain the system. This type of system would be adequate for H2S control in the proposed forcemain; however, the overall cost for this system would be relatively high for a lift station and forcemain of this relatively small size.

6.2.4 Sewer and Manhole Protection - Recommended Level 1

DEQ Pump Station Standards state that small discharges, or low-sulfide discharges, arising from detention times of less than one hour, the durability of the system may be sufficiently protected by installing corrosion-proof armoring or durable acid-proof coating to the downstream receiving sewer system. The projected forcemain detention time is approximately 29 minutes; therefore it is proposed to provide a sulfide resistant coating to the discharge manhole.

If high H_2S concentrations are still occurring this summer air injection will be used and the sulfide resistant coating will be unnecessary.

6.3 *Wetwell Corrosion Protection*

Detention times in the new wetwell will be well within DEQ guidelines. Concrete in the current wetwell is in good condition and does not exhibit H_2S problem. No corrosion protected concrete types or coatings are recommended for the new wetwell.

6.4 *Wetwell Buoyancy Calculation*

Groundwater levels above the bottom slab elevation of the wetwell will exert a buoyant force on the wetwell. If this buoyant force is not offset with adequate resistive force, there is a possibility that the wetwell could "float" and cause damage to connected pipes or the wetwell itself. The total buoyant force, assuming a groundwater level at the ground surface, is described as:

$$F_b = \gamma_w \times V_w$$

Where:

F_b = Buoyant Force (lbs)
γ_w = Density of water = 62.4 lbs/ft^3
V_w = Volume displaced by wetwell = π(7.33 ft/2)^2 x 24 ft = 1012 ft^3

Therefore:

$$F_b = 62.4 \text{ lb/ft}^3 \times 1{,}102 \text{ ft}^3 = 63{,}197 \text{ lbs}$$

The total resistive force is equal to the static weight of the wetwell, soil load on the base slab overhang, and the sliding resistance between the wetwell and adjacent soil. As a measure of conservatism, the effects of a soil wedge and sliding resistance will be ignored. In addition, the density of the soil will assume dry conditions. The total resistive force is described as:

$F_r = L_w + L_s$

Where:

F_r = Resistive Force
L_w = Weight of wetwell = Weight of floor (W_f) + Weight of walls (W_w) + Weight of roof (W_r)
L_s = Weight of soil

The weight of the wetwell will be calculated using a density of concrete of 150 pounds per cubic foot.

$W_f = \pi(10.0 \text{ ft} / 2)^2 \times 0.5 \text{ ft} \times 150 \text{ lbs/ft}^3 = 11{,}780 \text{ lbs}$
$W_w = [\pi(4.166 \text{ ft})^2 - \pi(3.5 \text{ ft})^2] \times 22.5 \text{ ft} \times 150 \text{ lbs/ft}^3 = 54{,}130 \text{ lbs}$
$W_r = \pi(9.333 \text{ ft} / 2)^2 \times 1.0 \text{ ft} \times 150 \text{ lbs/ft}^3 = 10{,}260 \text{ lbs}$

Therefore:

Lw = 11,780 lbs + 54,130 lbs + 10,260 lbs = 76,170 lbs

The weight of soil on foundation ledge will be calculated using a dry soil density of 70 pounds per cubic foot.

$L_s = [\pi(10.0 \text{ ft} / 2)^2 - \pi(8.333 \text{ ft} / 2)^2] \times 22.5 \text{ ft} \times 70 \text{ lbs/ft}^3 = 37{,}800 \text{ lbs}$

Therefore:

$F_r = L_w + L_s = 76{,}170 \text{ lbs} + 37{,}800 \text{ lbs} = 113{,}970 \text{ lbs}$

The resistive force (Fr) is 1.8 times greater than the buoyant force, therefore the buoyant force is satisfactorily countered by the resistive force and additional measures are not required.

6.5 *Pump Starts per Hour*

The proposed wetwell is designed to avoid excessive pump starts, based on the manufacturer's recommendation of 10 pump starts per hour. The maximum number of pump starts will occur when the inflow is equal to 50% of the pumps design capacity. The actual number of pump starts based on the proposed wetwell volume is presented below:

V_w = Total wetwell volume from LWL to HWL = 158 ft^3 = 1,180 gallons
Q_I = Rate of inflow = 700 gpm/2 = 350 gpm
T_f = Time to fill = V_w / Q_I = 1180 gallons / 350 gpm = 3.37 minutes
T_P = Time to pump down = $V_w / (Q_m - Q_I)$ = 1180 gallons / (700 gpm – 350 gpm) = 3.37 minutes
T_t = Total cycle time = $T_f + T_p$ = 3.37 min + 3.37 min = 6.74 minutes

The above calculations assume that one pump is out of service and two duty pumps are handling the load without alternation. The total cycle time of 6.74 minutes requires less than 9 pump starts per hour, which is less than the manufacturers recommended 10 pump starts per hour.

This estimation also assumes constant speed pumps, however each pump will be equipped with VFDs which will allow the pumps to run at reduced speed. By operating at a reduced speed it will be possible to significantly extend the time between pump starts.

6.6 *Odor Control*

The existing Pump Station 4 Lift Station does not exhibit excessive odor problems and the Owner has not requested odor controls on the new lift station.

6.7 *Emergency Backup Power Generation*

DEQ Standards require the provision of backup power capable of operation a lift station at its full design capacity during an extended power outage. This may be accomplished through a number of methods, including a secondary power feed to the station, an on-site standby generator, or provisions to connect a portable backup generator. In the case of the Pump Station 4 in Coos Bay, the recommended option is to locate a semi-permanent generator inside or adjacent to the electrical control building, along with an automatic transfer switch.

Generator sizing for this lift station has been determined using selection software distributed by Cummins Power Generation (Power Suite v4.1). The generator must provide power for one 20 HP pump and one 4 HP air compressor. Additional load at the station is expected to be less than 20 kW. In order to provide backup power for these loads with a reasonable factor of safety, a minimum 50 kW (standby rating) generator will be required.

DEQ Standards require standby generators to have a supply of fuel adequate for 24-hours of operation at full power. The recommended option for this application is a 24-hour capacity sub-base fuel tank. A sub-base fuel tank is installed between the equipment pad and generator frame. Additionally, an automatic transfer switch (ATS) is recommended to automatically transfer the lift station from line power to generator power in the case of a power outage. An ATS will also transfer the station back to line power at a preselected time after line power is restored, and will also automatically exercise the generator at predetermined intervals.

To fit within the confines of the granted easements and keep the building footprint small, an outdoor rated, sound shielded enclosure has been chosen. A 50 kW generator with a level 2 aluminum sound enclosure is approximately 8 ½ feet long x 3 ½ feet wide and 7 ½ feet tall. This generator would require a minimum clearance of 26 inches on all sides to allow space for the door hatches to open. For further protection the generator will be provided with shelter from falling rain by extending the control room roof overhead. See Figure 3 in the Appendix.

A concrete pad is required for the generator and will be extended out from the control room to provide proper anchoring. The enclosure provides protection from moisture and wind forces of up to 150 mph. Sound attenuation on the aluminum enclosure dampens the noise level to 72 decibels (dB). For comparison, a typical conversation is approximately 70 dB and heavy traffic is approximately 90 dB. See Figure 3 in the Appendix.

Based on estimates by Cummins Northwest, a 50 kW diesel-fired generator and ATS would cost approximately $28,400. Budgetary cost estimates are from Cummins Northwest, LLC.

6.7.1 Natural Gas-Fired Generator

There is a natural gas service pipeline at the intersection of 10th St and Anderson Avenues. A natural gas-fired generator option would eliminate the need for a 24-hour diesel fuel tank and periodic refueling, thereby reducing the time required by City personnel to operate and maintain the lift station. An additional benefit is a reduction in potential nuisance odors caused by diesel fuel and exhaust. By eliminating the need for a 24-hour capacity sub-base fuel tank, the initial cost of a natural gas-fired

generator is also somewhat less than the same capacity diesel generator. Much like diesel, the cost of natural gas varies seasonally and depending on demand.

Based on estimates by Cummins Northwest, a 50-kW natural gas-fired generator and ATS would cost approximately $24,400 with a level 2 noise rated aluminum enclosure. There will also be a cost associated with the installation of the natural gas service and connection. The estimated installation cost to install gas service is $3,260, making a natural gas-fired generator nearly the same cost as the diesel option. Service charges to the City would be approximately $30 per month if the convenience of natural gas is desired.

6.8 *Gravity Sewer Design*

Sewers shall be designed to have a velocity sufficient to "self-clean" solids through the system. Gravity pipe must be laid on a gradient necessary to produce a minimum 2 ft/sec fluid velocity when flowing half-full and/or completely full. Gradient must also be sufficient to convey the projected peak wastewater volume.

The capacity of the proposed receiving gravity sewer system has been evaluated using Manning's equation with a roughness coefficient of 0.013 (n = 0.013) for capacity and minimum velocity. Based on this analysis, it is determined that a 12-inch pipe laid at 0.003 ft/ft would be capable of conveying approximately 700 gpm while flowing 68% full. The wetwell and invert elevations are below sea level and it is recommended to stay with the minimum slope to avoid burying the structures deeper.

6.9 *Capacity of Existing Gravity Sewer System*

It is proposed to connect the new forcemain to manhole R-52 in drainage Basin "R". From this point the waste is conveyed down a steep slope of approximately 950 feet of 8-inch pipe. A 525 foot 10-inch pipe on a shallow slope then conveys waste to the 26-inch mainline to Pump Station 1.

The minimum slope of the existing 8-inch pipe is approximately 0.024 ft/ft. The capacity of the receiving pipe has been calculated using Manning's equation with a roughness coefficient of 0.013 (n = 0.013), which equates to an approximate capacity of 900 gpm. The existing gravity system is adequate to convey the maximum projected flow of 700 gpm from the proposed lift station; however, the sewer system must also convey other system flows.

A flow study completed in February 2010 found negligible I/I upstream from the Pump Station 4 discharge location and from lateral lines downstream of the discharge manhole. An approximation of the number of EDUs connected to this 8-inch line can be determined by counting the number of homes in the service area. Based on this count, there are approximately 60 buildings in the service area and for the purposes of estimating inflow we will assume a total of 60 EDUs. Applying the number of EDUs, number of persons per EDU, and per capita flows we get a total of 0.118 MGD PIF flow, or a total of 82 gpm.

Therefore the total approximate flow in the existing 8-inch pipe is approximately equal to the sum of the lift station design flow of 700 gpm and the PIF due to other connected sources of about 82 gpm, which is about 782 gpm. Assuming higher flows for a safety factor results in the 8-inch line likely being at capacity during a sizeable storm event. The 10-inch line under 8th Street is also potentially at capacity due to its shallow slope. In the future both of these lines should be replaced respectively with a 10-inch and 12-inch line.

In the meantime, controls at the new lift station should be monitored during record storm events either on site or via a future SCADA system to temporarily surcharge the system if overflows are observed at the discharge manhole.

6.10 *Land Acquisition*

Planned improvements at Pump Station 4 will require the City of Coos Bay to acquire additional land to provide space for the new wetwell, piping, valves and control building. The City was granted two easements, one in 2005, and one in 2007 that allow room for the construction of the new pump station, force main, and gravity lines. The existing property lines and proposed new property lines are shown on Figure 2 in the Appendix. At this time it does not appear any further land is needed.

6.11 *Easements*

The existing easements are sufficient for allowing room for the installation of the new force main and reverse grade gravity sewer lines.

6.12 *Temporary/Bypass Pumping*

Requirements for temporary bypass pumping during construction are expected to be minimal. The existing lift station and forcemain should be able to remain in service during construction of the new station. The proposed new wetwell and site piping should not interfere with the existing system.

During construction of the proposed new gravity line it may be necessary to take the existing station offline to avoid spilling sewage in the event of accidental breakage of the existing Cast Iron forcemain. Prior to construction it is recommended to dig exploratory holes to locate the existing forcemain and determine its depth. If it is determined that a shut-down is required, it is recommended to construct temporary tie-ins upstream and downstream of the construction area and to provide a temporary bypass pipe to avoid the construction area.

Additionally, it will be necessary to temporarily stop inflow to the influent manhole in Pump Station 4 while the new influent line is plumbed into the existing manhole. This shut down should be relatively short in duration and conducted during extended dry weather. In the case of the influent line flowing into existing manhole W-4 from the north, the system may be temporarily surcharged while the new line is installed. In the second case for the manhole W-2 receiving flows from the south and east, temporary submersible pumps should be used because of the low elevations and risks of flooding nearby basements during a surcharge.

There should be adequate room in both influent manholes to for both the new and old effluent lines to remain in place until startup testing on the new lift station is complete.

6.13 *Future Overflow Response and Considerations*

The new lift station will incorporate a 12-inch overflow pipe which shall discharge into the existing storm drain system. The existing storm drain empties almost immediately into Blossom Gulch Creek. Alternative discharge locations were considered but due to the surrounding topography those locations would result in overflows pooling into basements or surrounding parking lots with high exposure to small children.

Most of the Creek is protected from exposure where it passes through a box culvert until it reaches the Isthmus Slough. Overflow conditions would primarily impact the immediate fish hatchery area and the

vicinity of Blossom Gulch Elementary School. Flows in the drainage basin experience high I/I, therefore significant overflows may be diluted. No well water sources are located in the area.

City collection systems operators maintain emergency spill response procedures with a three class overflow plan. The overflow point of the pump station shall be sat approximately 15.75 feet above the wetwell bottom, giving collection systems operators ample warning between the high wetwell alarm and overflow alarm. Based upon the classification system in place for the City, overflows into the creek would be a Class 2 or Class 3 overflow, meaning sewage has reached surface water.

Class 2 and Class 3 overflows both require DEQ and OERS notifications as well as immediate warning signs and barricades in contaminated areas. Class 3 overflows require further notifications of the public and government agencies. These same procedures will be in place during construction and bypassing of the new lift station.

6.14 *Demolition and Abandonment of Existing Structures*

After construction of the new lift station it will be necessary to decommission the existing lift station, both influent lines, two manholes and the forcemain. For decommission of the influent line, site piping, manholes and forcemain it is recommended to slurry fill the lines to prevent eventual collapse of the pipes or sinkholes. Each end of each pipe should be permanently plugged with concrete. The wetwell and manhole structures should be stripped of any materials of value and any materials that may pose environmental hazard. It is recommended to remove the above ground structure and to fill the below ground structure with an epoxy-sand slurry, cementitious slurry, or polyurethane foam up to a point roughly six feet below finished grade. The area should then be backfilled and the surface finished appropriately.

6.15 *Recommended Sequence of Work*

The first phase of construction should include all tasks on-site that do not require bypass pumping or shut-down of the existing pumping system. These tasks would include construction of the new wetwell, site piping, valve and flow meter vaults, electrical/control building, electrical service, panels and site wiring and generator. This construction should be able to occur without disrupting the operation of the existing lift station.

Phase two of construction should include installation of the new forcemain under the vacated and unvacated portions of 11th Street to the discharge manhole. The gravity main from manhole W-2 to the new pump station should also be installed as well. The majority of this work can occur during construction of the lift station. The tie-in of the new forcemain must occur after the lift station site piping has been installed. It may be necessary to temporarily re-route the existing forcemain during installation of the forcemain, see Section 6.7 above.

The third phase of construction should be the final connection of the new influent pipe to the upstream manholes. The final connection of the new influent pipe will require the permanent removal of the old influent pipe. After connection of the new influent pipe, it should be possible to perform initial startup of the new lift station and final testing of pumps, controls and station program.

After successful startup of the new station, it will be possible to install new asphalt-cement pavement, gravel surfacing, and final site clean-up.

7.0 Preliminary Construction Cost Estimate

The cost estimates presented below include three components: construction cost, engineering cost, and contingency. The estimates presented herein are preliminary and are based on the level and detail of planning presented in this Report. Construction costs are based on competitive bidding as public works projects. As projects proceed and additional site-specific information becomes available, the estimates may require updating.

7.1 *Discussion of Options*

Presentations of two reasonable options for the improvement of Pump Station 4 have been developed in this report. Both options include a new wetwell, manholes, pump system, new electrical and control building, site improvements, new forcemain and some new gravity pipe.

Option 1 would have a slightly smaller wetwell, only 2 pumps, and a smaller valve vault. This would include 2 header pipes that connect outside the vault using a wye connection. With 2 pumps redundancy requirements would be met while simplifying the construction of the lift station. A duplex configuration will have a lower initial capital cost and the pumps configuration will be more efficient in electricity consumption.

The second option has a slightly larger diameter wetwell, utilizes 3 pumps, and requires a wider valve vault. Three header pipes will connect outside the valve vault using wye connections. A 3 pump configuration allows for rotational use of pumps and operation of only a single pump during summer flows. Rotating pump use prolongs the life of the pump resulting in a lifetime cost savings. Initial capital costs are approximately $15,000 higher and the electrical consumption of the Triplex Option is higher even when only one pump is in operation.

Option 1 is recommended as space availability within the property easement favor a smaller wetwell and vault and the lift station design and operation will be simplified.

7.2 *Construction Costs*

The estimated construction costs in this Section are based on actual construction bidding results from similar work, published cost guides, and other construction cost experience. Reference was made to the available maps of the existing system to determine construction quantities, elevations of the force main, and locations of influent lines and force main. Where required, estimates will are based on preliminary layouts of the proposed improvements.

7.3 *Contingency*

A contingency factor equal to approximately fifteen percent (15%) of the estimated construction cost has been added to the costs estimated in this section. In recognition that the cost estimates presented are based on preliminary design, allowances must be made for variations in final quantities, bidding market conditions, adverse construction conditions, unanticipated specialized investigation and studies, and other difficulties which cannot be foreseen at this time but may tend to increase final costs. Upon final design completion of any project, the contingency can be reduced to 10%. A contingency of at least 10% should always be maintained going into a construction project to allow for variances in quantities of materials and unforeseen conditions.

7.4 *Engineering*

The cost of engineering services for major projects typically include special investigations, surveying, preparation of contract drawings and specifications, bidding services, construction management, inspection, construction staking, start-up services, and the preparation of system maps. Depending on the

size and type of project, engineering costs may range from 18 to 25% of the contract cost when all of the above services are provided. The lower percentage applies to large projects without complicated mechanical systems. The higher percentage applies to small or complicated projects. Engineering costs for design and construction services presented in this Predesign Report are based on 20% of the estimated construction cost.

7.5 *Administrative*

An allowance of three percent (3%) of construction cost has been included for legal and administrative services. This allowance is intended to include internal project planning and budgeting, grant administration, liaison, legal services, and other related expenses associated with the project that the City could incur.

7.6 *Opinion of Probable Cost*

As presented in the analysis and discussions above, the Duplex Option has been recommended. Probable costs for the two different levels of sulfide control are provided.

Table 7.6a – Probable Cost – Duplex Lift Station with Armored Discharge Manhole

Pump Station 4 - Duplex Option, Armored Discharge Manhole					
Item	Description	Unit	Quantity	Unit Cost	Construction Cost
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	All	$68,500	$68,500
2	Construction Facilities, Temporary Systems and Bypass Provisions	LS	All	$55,100	$55,100
3	Wetw ell, Excavation, Installation	LS	All	$83,700	$83,700
4	Dew atering, shoring, bracing	LS	1	$70,000	$70,000
5	20 HP Pump, VFD, Accessories and Installation	EA	2	$25,000	$50,000
6	Electrical, Wiring, Panels, Level Controls, PLC, Dialer	LS	All	$54,000	$54,000
7	50 kW Generator, Fuel Supply, ATS, Ventilation and Ducting	LS	All	$30,000	$30,000
8	Electrical Building w ith Generator Roof	Sq Ft	224	$240	$53,760
9	Site Piping, Valves, Fittings and Vault	LS	All	$43,000	$43,000
10	Flow meter and Vault	LS	All	$15,000	$15,000
11	12-Inch Influent Pipe	LF	240	$85	$20,400
12	Site Work, Pavement, Fence and Electric Gate	LS	All	$27,500	$27,500
13	Retaining Wall	SF	480	$25	$12,000
14	8-inch Trenched Forcemain and AC Trench Patch	LF	458	$65	$29,770
15	Coat Discharge Manhole	LS	1	$2,000	$2,000
16	New Manholes	LF	3	$3,500	$10,500
17	Demolition and Abandonment of Lift Station and Forcemain	LS	All	$49,700	$49,700
18	Misc. Restoration and Clean Up	LS	All	$10,000	$10,000
		Construction Total			$684,930
		Contingency (15%)			$102,740
		Subtotal			$787,670
		Engineering (20%)			$157,534
		Environmental Report			$20,350
		Administrative Costs (3%)			$23,630
		Total Project Cost			**$989,183**

Table 7.6b – Probable Cost – Duplex Lift Station with Air Injection

Pump Station 4 - Duplex Option					
Item	Description	Unit	Quantity	Unit Cost	Construction Cost
1	Mobilization, Insurance, Overhead, Bonds (10%)	LS	All	$70,100	$70,100
2	Construction Facilities, Temporary Systems and Bypass Provisions	LS	All	$56,400	$56,400
3	Wetw ell, Excavation, Installation	LS	All	$83,700	$83,700
4	Dew atering, shoring, bracing	LS	1	$70,000	$70,000
5	20 HP Pump, VFD, Accessories and Installation	EA	2	$25,000	$50,000
6	Electrical, Wiring, Panels, Level Controls, PLC, Dialer	LS	All	$55,000	$55,000
7	50 kW Generator, Fuel Supply, ATS, Ventilation and Ducting	LS	All	$30,000	$30,000
8	Electrical Building w ith Generator Roof	Sq Ft	224	$240	$53,760
9	Site Piping, Valves, Fittings and Vault	LS	All	$43,000	$43,000
10	Flow meter and Vault	LS	All	$15,000	$15,000
11	12-Inch Influent Pipe	LF	240	$85	$20,400
12	Site Work, Pavement, Fence and Electric Gate	LS	All	$27,500	$27,500
13	Retaining Wall	SF	480	$25	$12,000
14	8-inch Trenched Forcemain and AC Trench Patch	LF	458	$65	$29,770
15	H2S Compressor, air line, injection port	LS	1	$9,500	$9,500
16	New Manholes	LF	4	$3,500	$14,000
17	Demolition and Abandonment of Lift Station and Forcemain	LS	All	$50,700	$50,700
18	Misc. Restoration and Clean Up	LS	All	$10,000	$10,000
		Construction Total			$700,830
		Contingency (15%)			$105,125
		Subtotal			$805,955
		Engineering (20%)			$161,191
		Environmental Report			$20,350
		Administrative Costs (3%)			$24,179
		Total Project Cost			**$1,011,674**

8.0 Lift Station Design Summary

The proposed lift station is a duplex submersible type with Flygt model NP3153.091 pumps with 263 mm (#463) impellers, 20 HP motors with VFD designed with a design capacity of 700 gpm @ 44.5 feet TDH. Back-up power will be provided by onsite diesel or natural gas generator and automatic transfer switch. Alarm telemetry will be through a telephone autodialer until a *systemwide* SCADA system is implemented for the City of Coos Bay. Proposed lift station will provide EPA Class 1 reliability and adheres to all DEQ requirements.

The proposed forcemain is an 8-inch HDPE DR17 pipe discharging into an existing manhole and gravity sewer in the adjacent drainage basin. It is proposed to install the new forcemain by trenching from the lift station site to intersection of 11th St and the alley between Central and Anderson Avenues. The forcemain will have a low point at the southern end of the vacated 11th St right of way and a constantly ascending profile from the low point to the point of discharge. The volume of the proposed forcemain is approximately 1,116 gallons and will have a detention time of approximately 29 minutes based on current summer base flows measured during the months of August and September. It is proposed to armor the discharge manhole to mitigate sulfide attack.

Table 8.0 – New Lift Station Design Data

Proposed Lift Station	
Type of Station	Duplex Submersible
Pump Type	Flygt Model NP3153.091 with w/ 263mm (#463) Impeller
Motor Type	20 HP, 460 Volt, 3-Phase, 60Hz, 1750 rpm, Explosion Proof
Drive	Variable Frequency w/ Bypass
Pump Performance	700 gpm @44.5 feet TDH (one pump running)
Pump Starts	Approximately 9 starts per hours, 6.74 minute cycle time
Pump Level Control	Submersible Pressure Transducer with redundant floats
Auxiliary Power	50KW (460V, 3-phase) Outdoor quiet enclosure
Fuel Capacity	>24 Hours with Diesel 140 gallon subbase tank
Transfer Switch	Automatic, generator exercising
Alarm Telemetry	Dialer, then SCADA
EPA reliability	Class 1
Alarms	High wet well, low wet well, power failure, generator run, pump failure.
Proposed Forcemain	
Type	8-Inch HDPE DR17
Length	480 Feet
Profile	Descending then Ascending
Discharge	Manhole R-52 on 11th Street into Basin R
Detention Volume	1116 gallons
Average Detention	29.4 minutes at current (2009) base flow
Sulfide Control	Armored discharge manhole, air injection if required.
Air injection (if required)	> 16 scfm from 4HP rotary compressor at 30 feet of head

8.1 *Pump Control and Alarm Schedule*

Pump set points and system alarms have been developed based on the operation strategies described in this report. Pump controls will include a PLC based control system and VFDs for each pump. The pump program will have provisions to alternate each of the two pumps as the lead pump. PLC programming can also initiate a forcemain flushing cycle based on time or cycle counts. Pump start and stop functions, as well as system alarms will be based on water level in accordance with DEQ requirements.

Table 8.1 – Pump Control and Alarm Schedule

Point Description	Level Above Bottom of Wetwell	Water Surface Elevation
Low Level Alarm	1.0 ft	-7.0 ft
(LWL) Pumps Off	1.5 ft	-6.5 ft
Pump On	5.1 ft	-2.9 ft
Pump Ramp up (HWL)	5.6 ft	-2.3 ft
Pump Slow Down	5.1 ft	-2.9 ft
Pumps Off	1.5 ft	-6.5 ft
High Level Alarm	6.6 ft	-1.3 ft
Overflow Alarm	15.5 ft	7.5 ft

APPENDIX A

PRELIMINARY PLANS

(VACATED) 11TH STREET

10th STREET

AC PARKING LOT

PL

EASEMENT GRANTED FOR NEW LIFT STATION LOCATION (GRASS)

GRAVEL AREA

STORM MH

12" INLET

10' INLET

12" OUTLET

GRASSY AREA

GRASSY AREA EDGE OF PAVEMENT

SAN MH W-4

PAVED AREA

10

GRANTED PERMANENT UTILITIES EASEMENT

GRANTED TEMPORARY CONSTRUCTION EASEMENT

SAN MH W-3

10"

MH W-2

EXISTING WEST INFLUENT PIPE BURIED UNDER HEAD START BUILDING, TO BE ABANDONED

MH W-1

12"

BLOSSOM CREEK

BLOSSOM GULCH GREEK AREA OF TIDAL FLOODING

PS 4

6" INLET

10" OUTLET

6" INLET

PRIVATE MH

PAVED AREA PARKING

EXISTING PUMP STATION 4 LIFT STATION, TO BE REMOVED AND WETWELL ABANDONED

EXISTING 6" CAST IRON FORCEMAIN, TO BE ABANDONED

EXISTING EAST INFLUENT PIPE

MH W-16 (OLD PS LOCATION)

12"

EXISTING 16" INFLUENT PIPE, TO BE ABANDONED

MH W-17

8"

C.CELL

MH W-18

EXISTING MANHOLE W-1 TO BE ABANDONED INVERT -0.53

PROPERTY LINE

BLOSSOM GULCH SCHOOL

1/F1 EXISTING SITE AREAS

N

PLAN SCALE

20 0 10 20 40

MANHOLE R-51

EXISTING DISCHARGE MANHOLE, FORCEMAIN TO BE ABANDONED, CORRODING

10th STREET

GRASSY AREA EDGE OF PAVEMENT

2/F1 EXISTING DISCHARGE

N

PLAN SCALE

20 0 10 20 40

Civil West Engineering Services, Inc.

CITY OF COOS BAY
COOS COUNTY, OREGON

EXISTING SITE

PUMP STATION 4 REPLACEMENT

1"
0
1"=40'

DRAWN BY: JBH
DATE: APR. 13, 2010

FIGURE
1

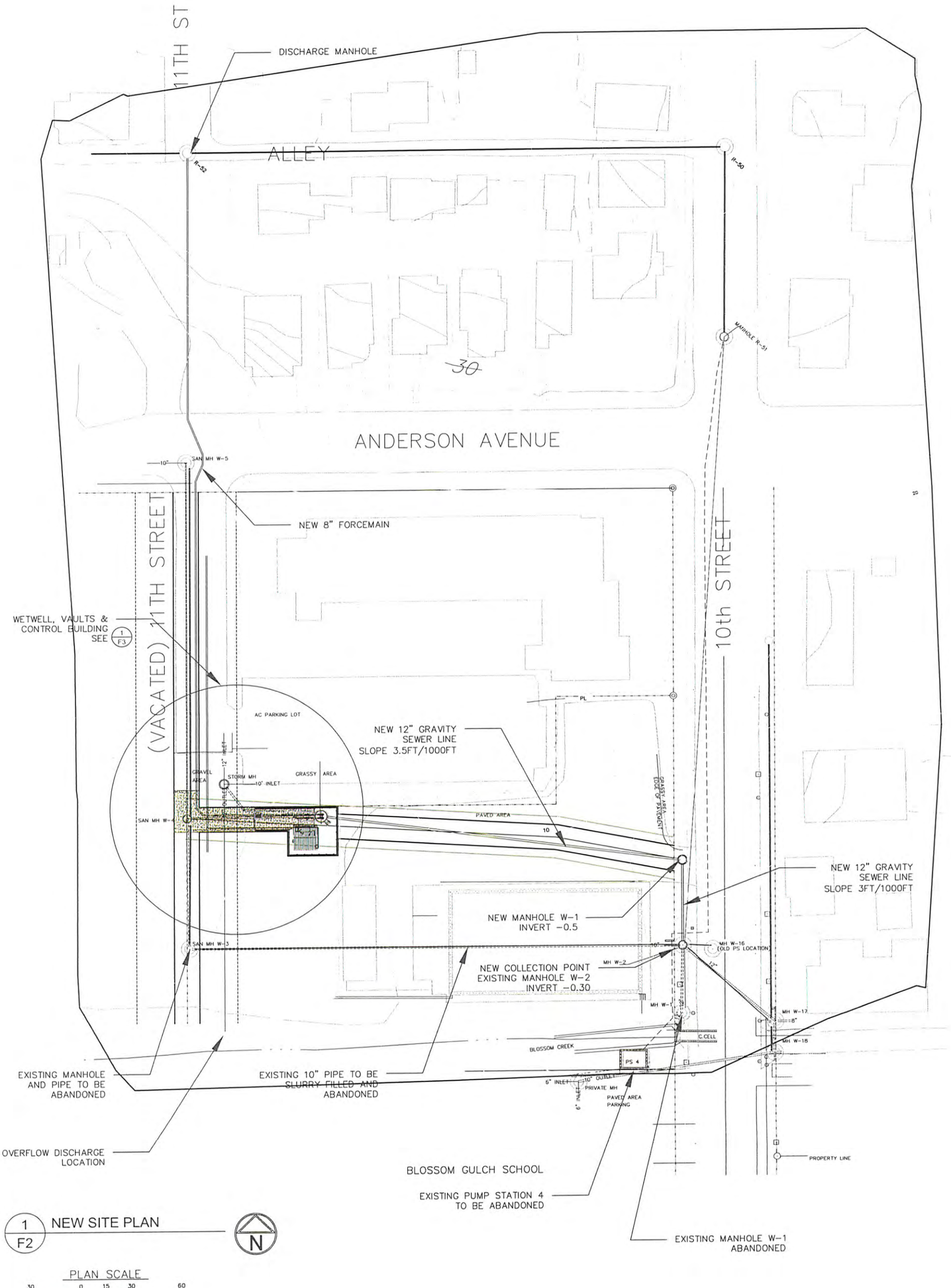


FIGURE 2

0 1"

1" = 60'

DRAWN BY: JBH

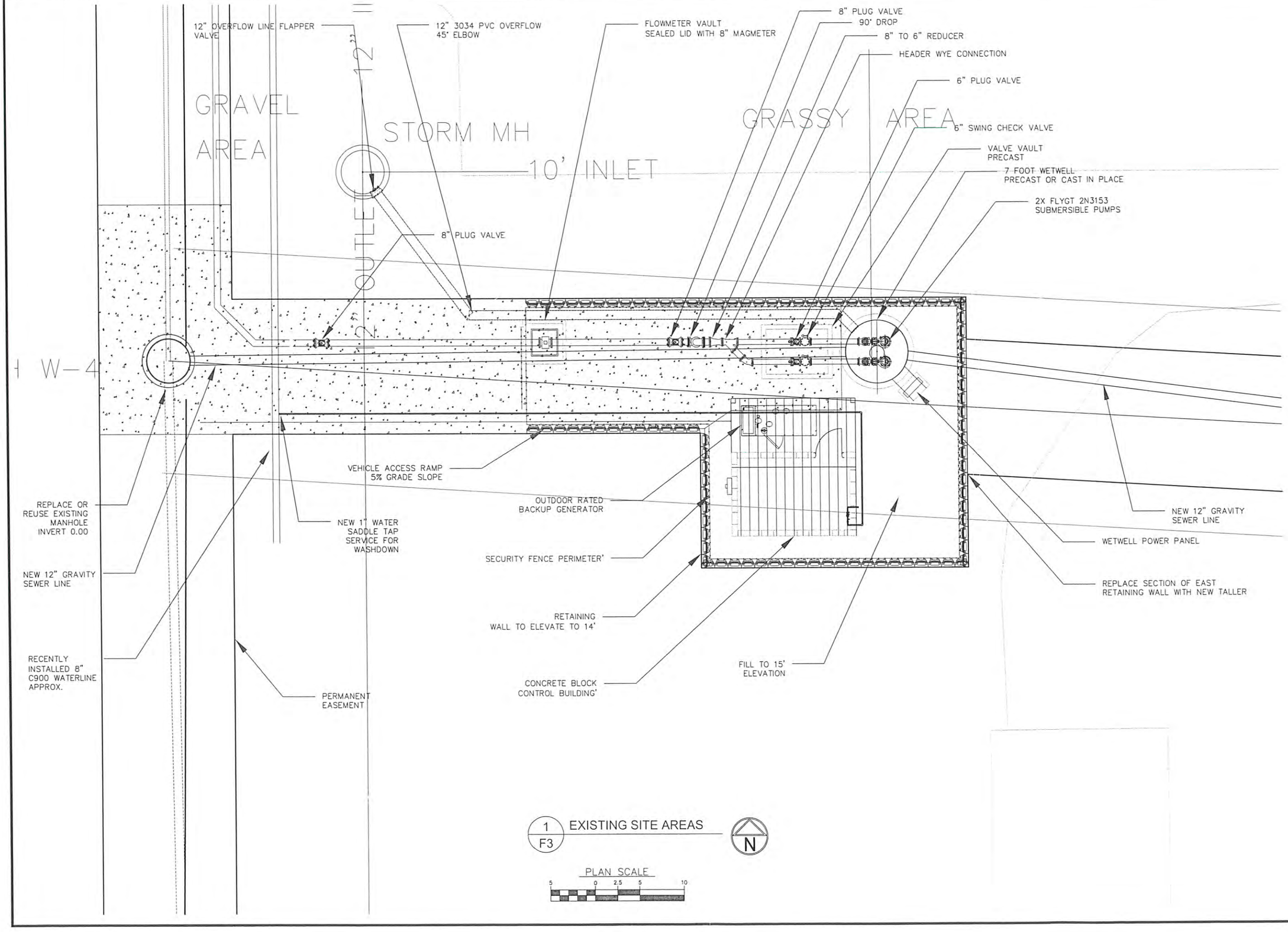
DATE: APR. 13, 2010

PROPOSED SITE PLAN

PUMP STATION 4 REPLACEMENT

CITY OF COOS BAY
COOS COUNTY, OREGON

Civil West Engineering Services, Inc.



1/F3 EXISTING SITE AREAS

N

PLAN SCALE

5 0 2.5 5 10

Civil West Engineering Services, Inc.

CITY OF COOS BAY
COOS COUNTY, OREGON

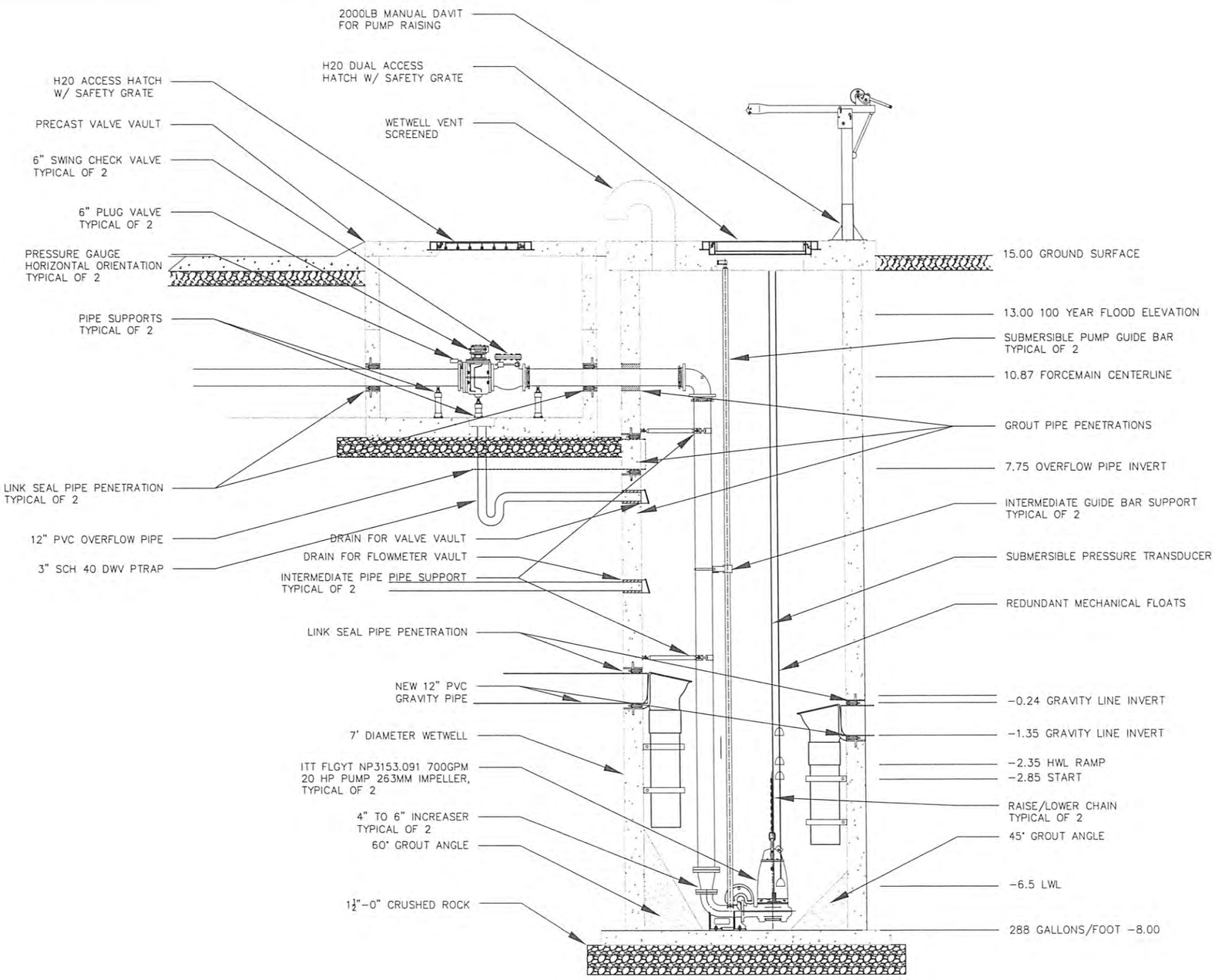
SITE PIPING

PUMP STATION 4 REPLACEMENT

1" = 10'

DRAWN BY: JBH
DATE: APR. 13, 2010

FIGURE
3



1/F4 WETWELL AND VAULT ELEVATION

PLAN SCALE

24" 0 12" 24" 48"

Civil West Engineering Services, Inc.

CITY OF COOS BAY
COOS COUNTY, OREGON

FORCEMAIN PROFILE

PUMP STATION 4 REPLACEMENT

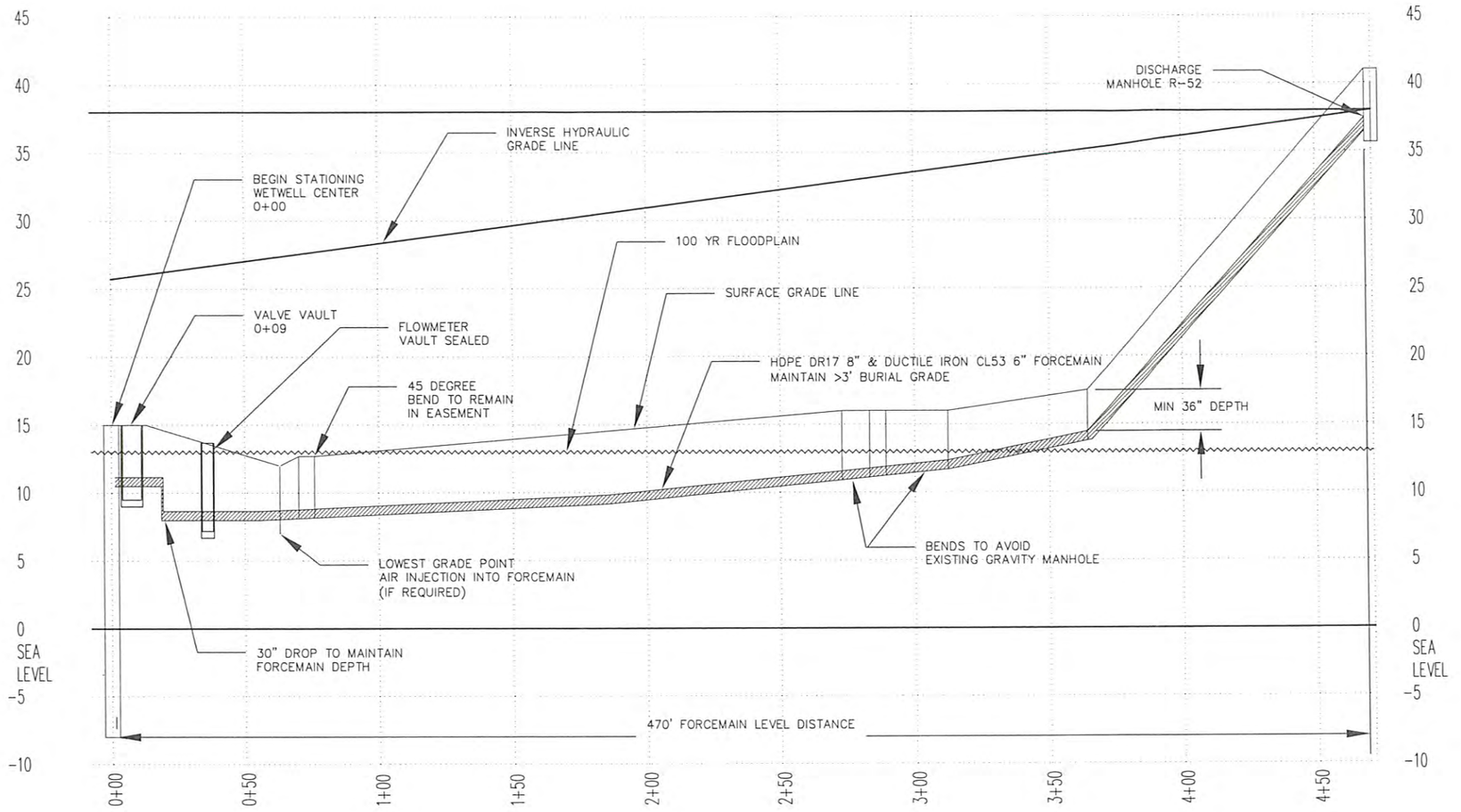
1" = 4'

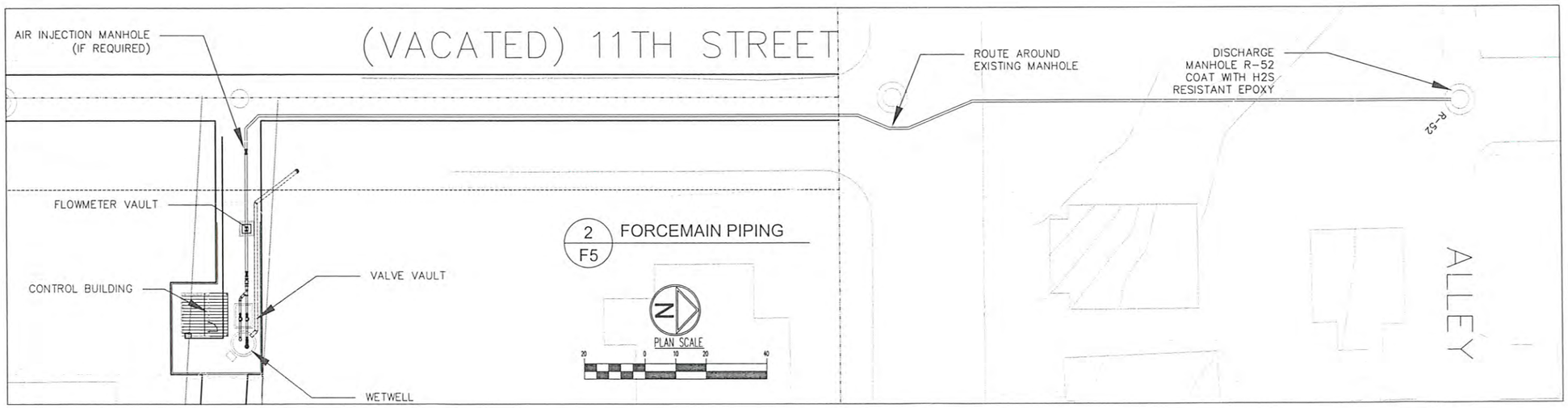
DRAWN BY: JBH
DATE: APR. 13, 2010

FIGURE
4

1 / F5 FORCEMAIN PROFILE

PLAN SCALE
50 0 12.5 25 50
5 0





2 / F5 FORCEMAIN PIPING

N

PLAN SCALE
20 0 10 20 40

Civil West Engineering Services, Inc.

CITY OF COOS BAY
COOS COUNTY, OREGON

FORCEMAIN PROFILE

PUMP STATION 4 REPLACEMENT

1" 0 VARIES

DRAWN BY: JBH
DATE: APR. 13, 2010

FIGURE 5

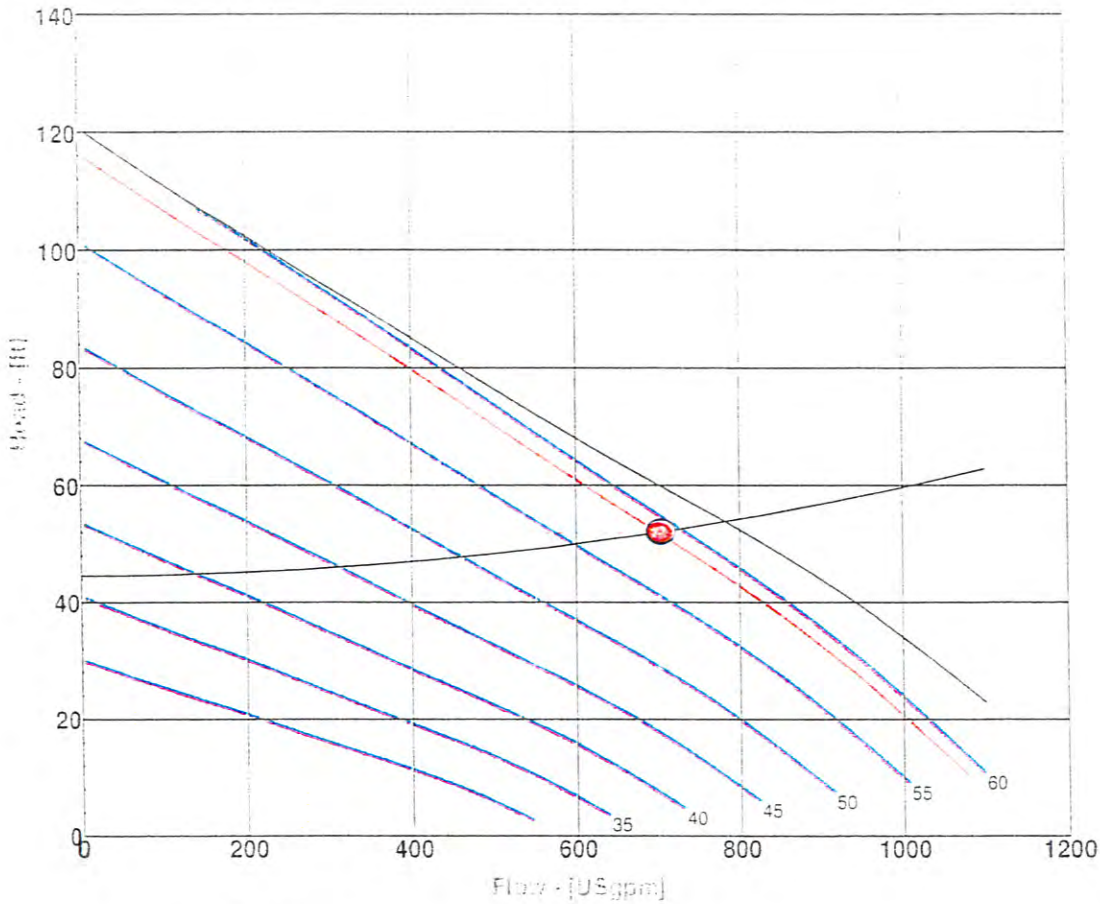
APPENDIX B

FLYGT PUMP INFORMATION

VFD-Analysis - Performance

Project: Coos Bay Pump Station 4

Created by:: Jerek Hodge



Performance

Pump: N 3153 63-463-00-6050

PRODUCT DATA

Imp. diam.: 263 mm

Rtd. pwr.: 20 hp

Vanes: 2

Throughlet: 0 inch

Connection: Single

VFD connection: 1-VFD pump

No of pumps: 1

Frequency: 59 Hz

Flow: 704.3 USgpm

Head: 52.0 ft

Pwr cons.: 13.5 kW

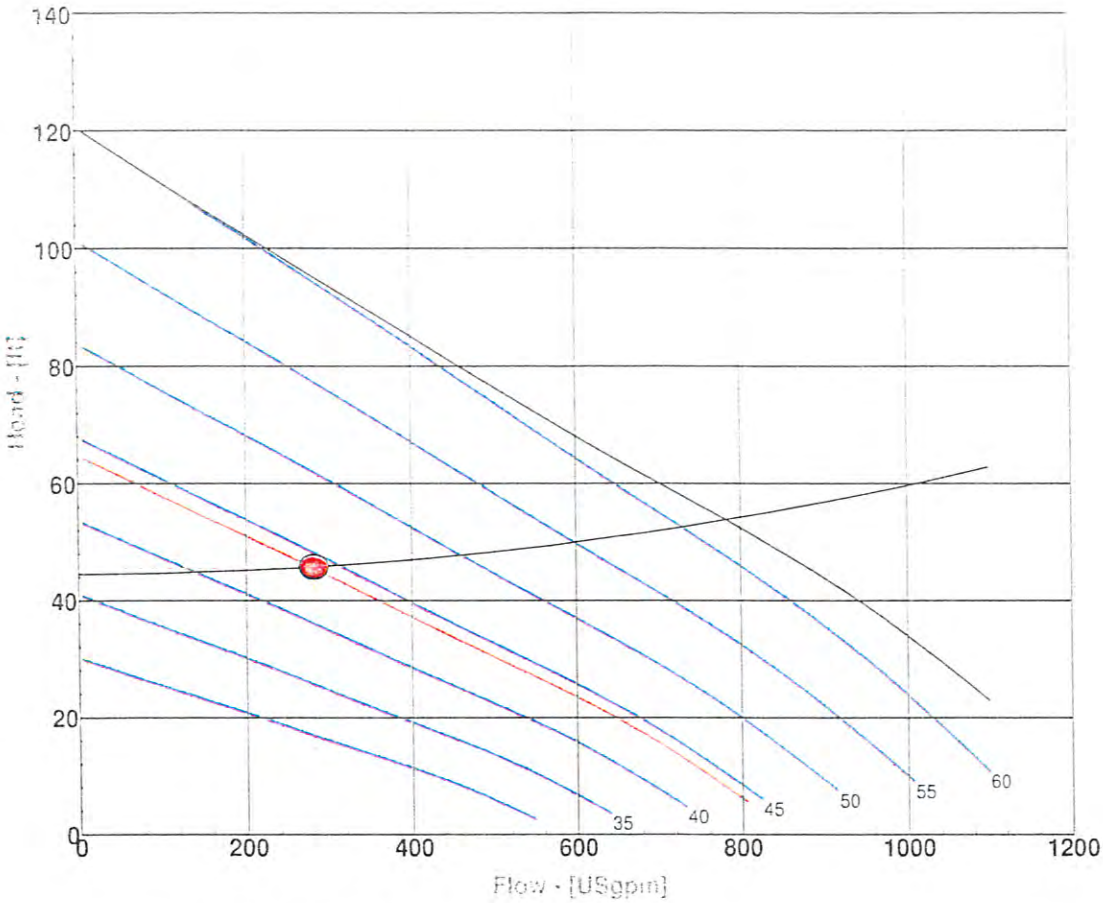
Overall eff: 51.1 %

Spec. energy: 319.2 kWh/Mg

VFD-Analysis - Performance

Project: Coos Bay Pump Station 4

Created by:: Jerek Hodge



Performance

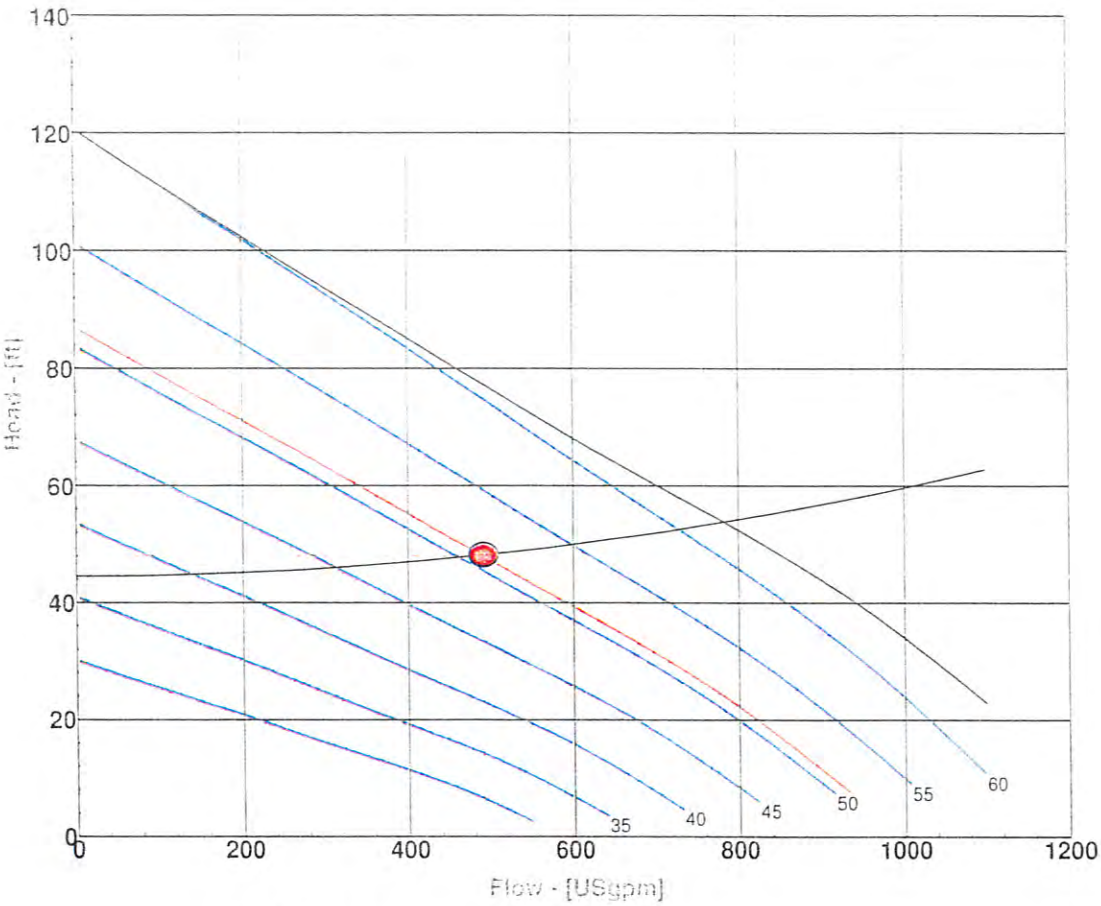
Pump: N 3153 63-463-00-6050
PRODUCT DATA
Imp. diam.: 263 mm
Rtd. pwr.: 20 hp
Vanes: 2
Throughlet: 0 inch

Connection: Single
VFD connection: 1-VFD pump
No of pumps: 1
Frequency: 44 Hz
Flow: 281.8 USgpm
Head: 45.7 ft
Pwr cons.: 5.1 kW
Overall eff: 47.2 %
Spec. energy: 304.1 kWh/Mg

VFD-Analysis - Performance

Project: Coos Bay Pump Station 4

Created by:: Jerek Hodge



Performance

Pump: N 3153 63-463-00-6050

PRODUCT DATA

Imp. diam.: 263 mm

Rtd. pwr.: 20 hp

Vanes: 2

Throughlet: 0 inch

Connection: Single

VFD connection: 1-VFD pump

No of pumps: 1

Frequency: 51 Hz

Flow: 490.5 USgpm

Head: 48.1 ft

Pwr cons.: 8.6 kW

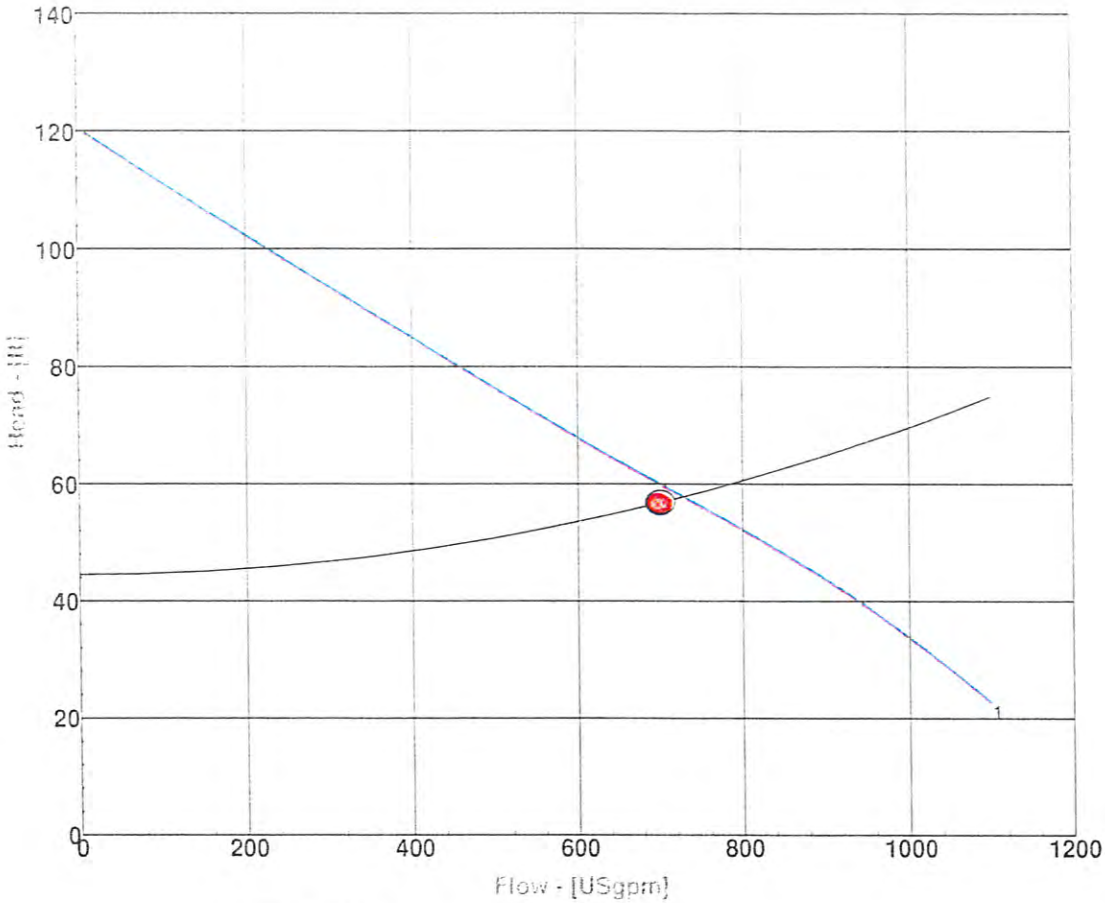
Overall eff: 51.7 %

Spec. energy: 292.1 kWh/Mg

Duty Analysis - Performance curves

Project: Coos Bay Pump Station 4

Created by:: Jerek Hodge



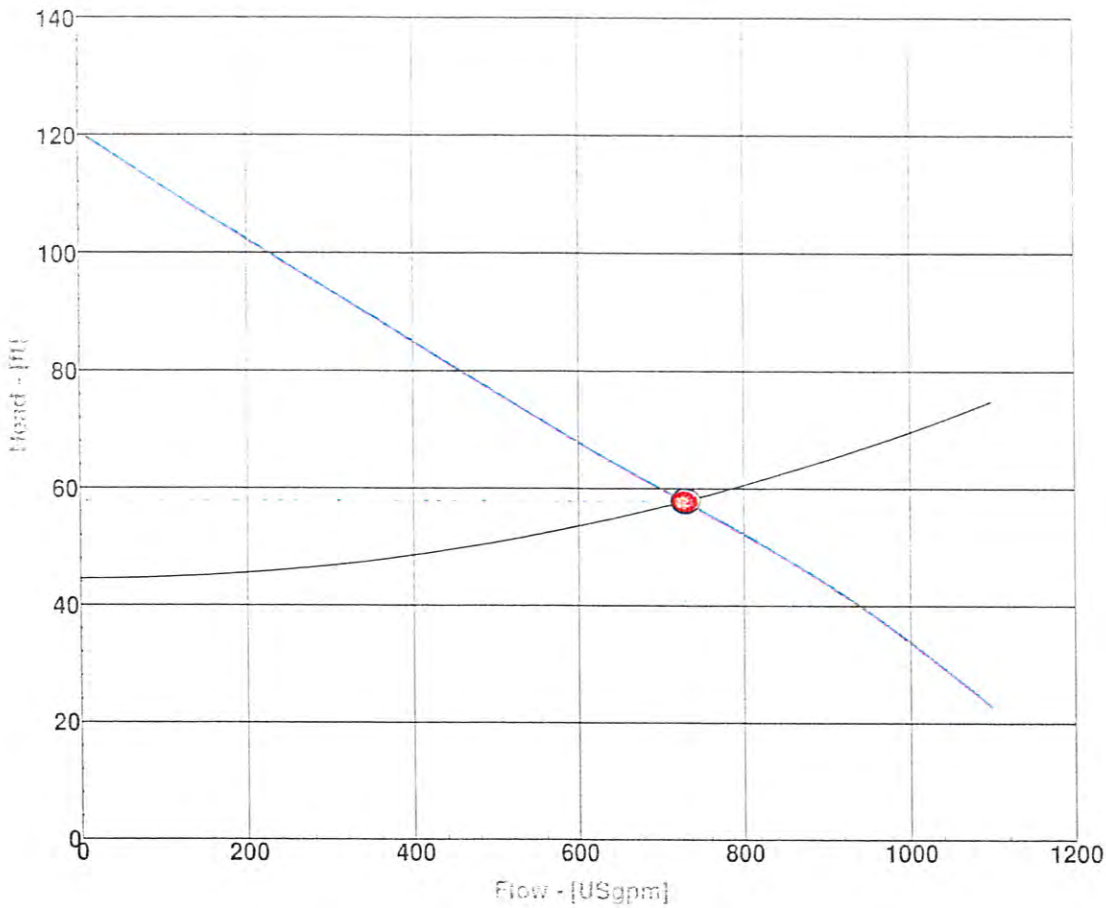
Performance

1. NP 3153 - 63-463-00-6050 20 hp 263 mm

Duty Analysis - Duty conditions

Project: Coos Bay Pump Station 4

Created by:: Jerek Hodge



Pump curve

1 NP 3153 63-463-00-6050

PRODUCT DATA

Rtd. pwr.: 20 hp

Imp. diam.: 263 mm

Vanes: 2

Throughlet: 0 inch

DUTY CONDITIONS

No of pumps: 1

Flow: 729.7 USgpm

Head: 57.8 ft

Shaft power: 16.3 hp

Pump efficiency: 65.5 %

Specifc energy: 313.9 kWh/mg

NPSHre: 17.5 ft

FLYGT

Rating

Frequency	60 Hz	Product	3153 . 091	Issue	1
Phases	3	Motor #	21-18-4AA	# of Starts/Hr	30
Poles	4	Rated power	20.0 hp	Issue date	
Approval	FM	Installations	PSTZ	Valid from	4/27/2005
-	N	Type of duty	S1	Status	APPR

Rtd. amb. temp. 40 °C / 104 °F

	Alternative 1	*Alternative 2*		
Voltage	460 V	230 V	Stator variant	05
Connection	YSER	Y//	Speed	1755 r/min
Rtd. Curr.	26.0 A	52.0 A	Module	164
Starting current	148.0 A	296.0 A	Motor issue	12
Power factor	0.83	0.83		
NEMA code letter	G	G		

Warm liquid data	Note! Reduced rated power			
Rtd. amb. temp.	°C /	°F	°C /	°F
Rtd. Curr. (1)	A		A	
Rtd. Curr. (2)	A		A	
Max input power	kW		kW	

ITT Water & Wastewater

PERFORMANCE CURVE

PRODUCT	TYPE
NP3153.091	HT

DATE	PROJECT	CURVE NO	ISSUE
2010-04-13	Coos Bay Pump Station 4	63-463-00-6050	6

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.83	0.77	0.66
EFFICIENCY	87.5 %	89.0 %	89.0 %
MOTOR DATA	---	---	---

RATED POWER ...	20	hp
STARTING CURRENT ...	148	A
RATED CURRENT ...	26	A
RATED SPEED ...	1755	rpm
TOT.MOM.OF INERTIA ...	0.097	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 263 mm

MOTOR #	STATOR	REV
21-18-4AA	05YSER	12

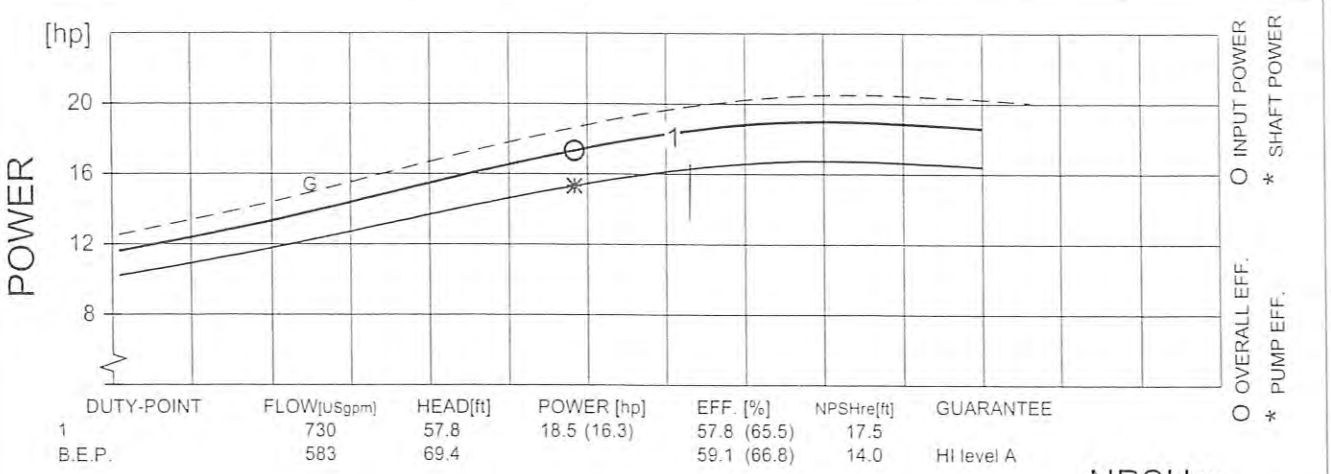
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

GEARTYPE	RATIO
---	---

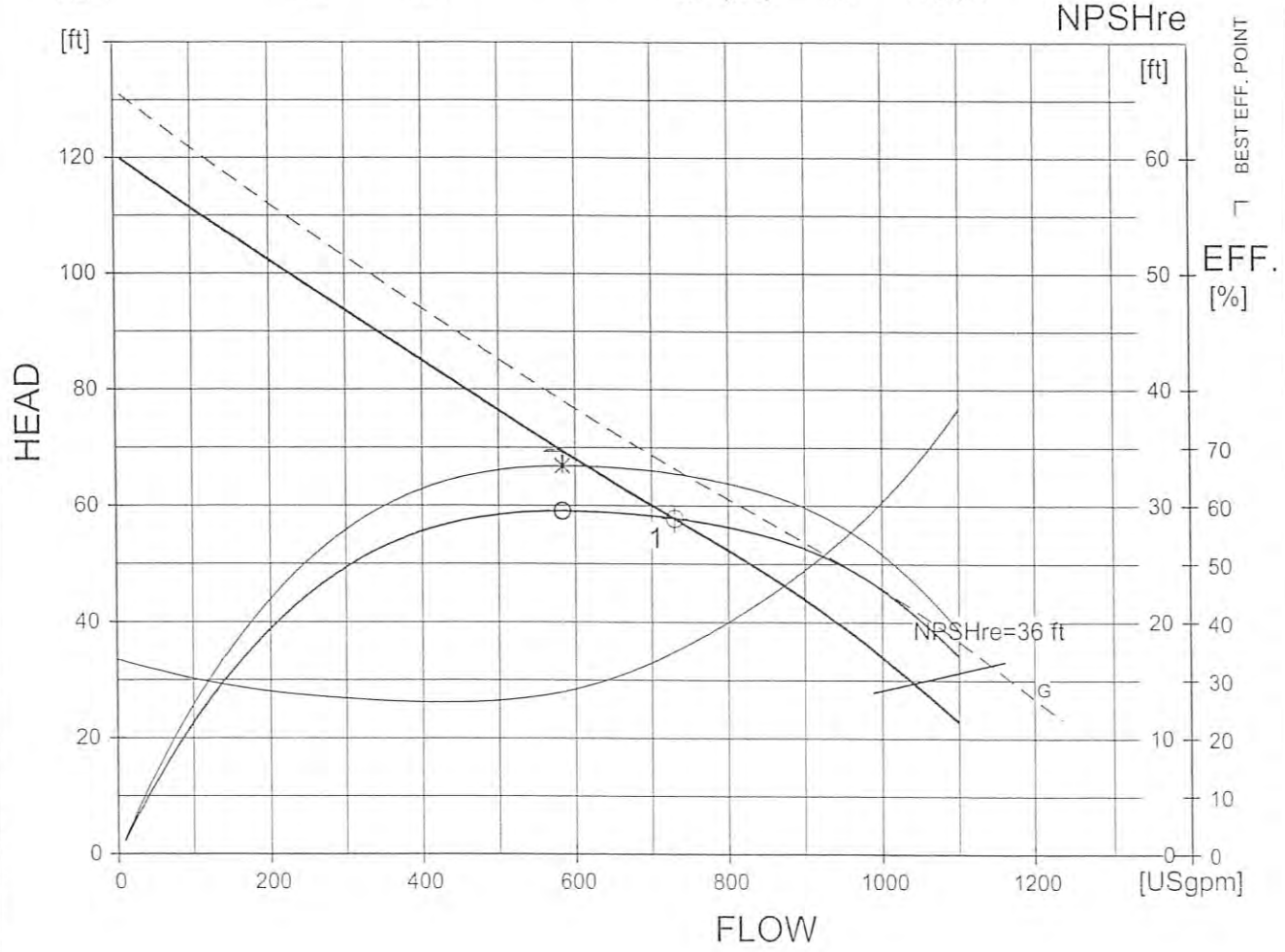
COMMENTS

INLET/OUTLET: -/ 4 inch

IMP. THROUGHLET: ---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]	GUARANTEE
1	730	57.8	18.5 (16.3)	57.8 (65.5)	17.5	
B.E.P.	583	69.4		59.1 (66.8)	14.0	HI level A



FLYPS3.1.6.5 (20090313)

NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

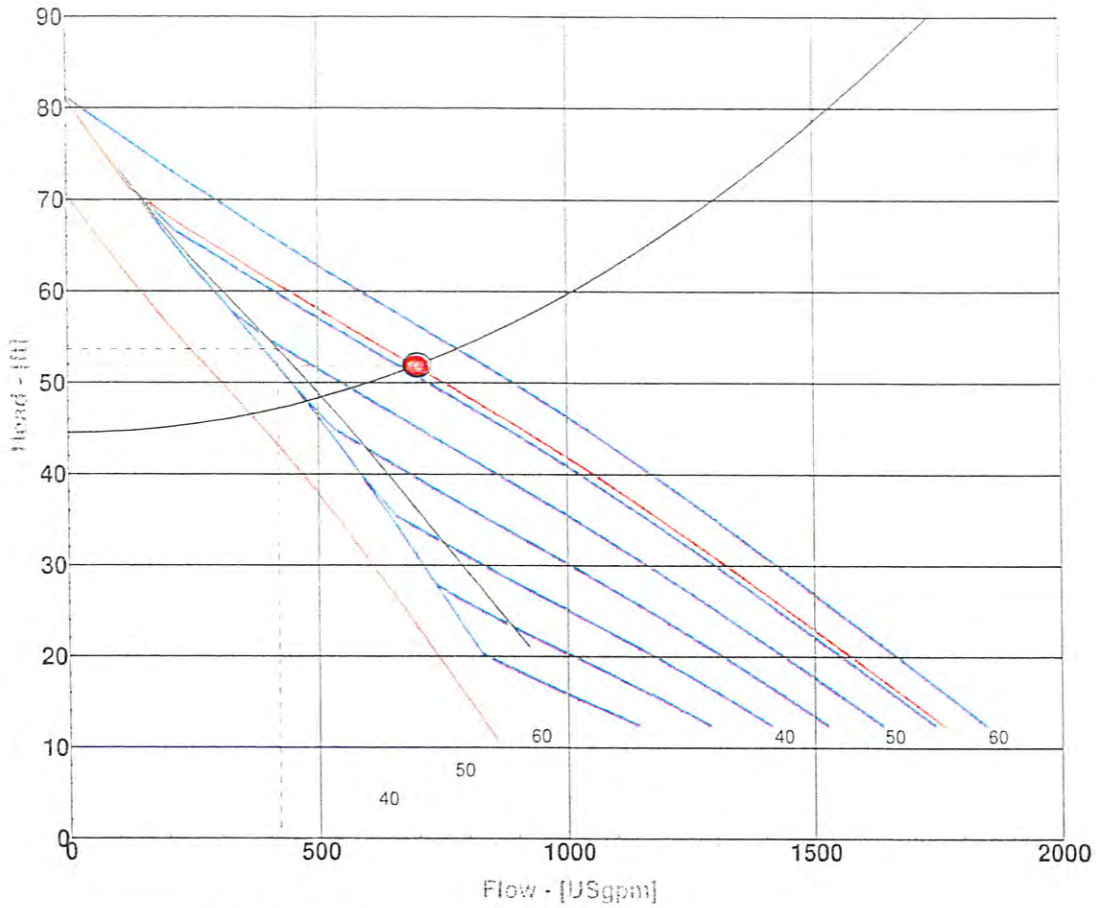
GUARANTEE BETWEEN LIMITS (G) ACC. TO

HI level A

VFD-Analysis - Performance

Project: Coos Bay Pump Station 4

Created by:: Jerek Hodge



Performance

Pump: N 3127 63-488-00-3702

PRODUCT DATA

Imp. diam.: 215 mm

Rtd. pwr.: 10 hp

Vanes: 2

Throughlet: 0 inch

Connection: Parallel

VFD connection: 1-VFD pump

No of pumps: 2

Frequency: 56 Hz

Flow: 700.1 USgpm

Head: 51.9 ft

Pwr cons.: 13.1 kW

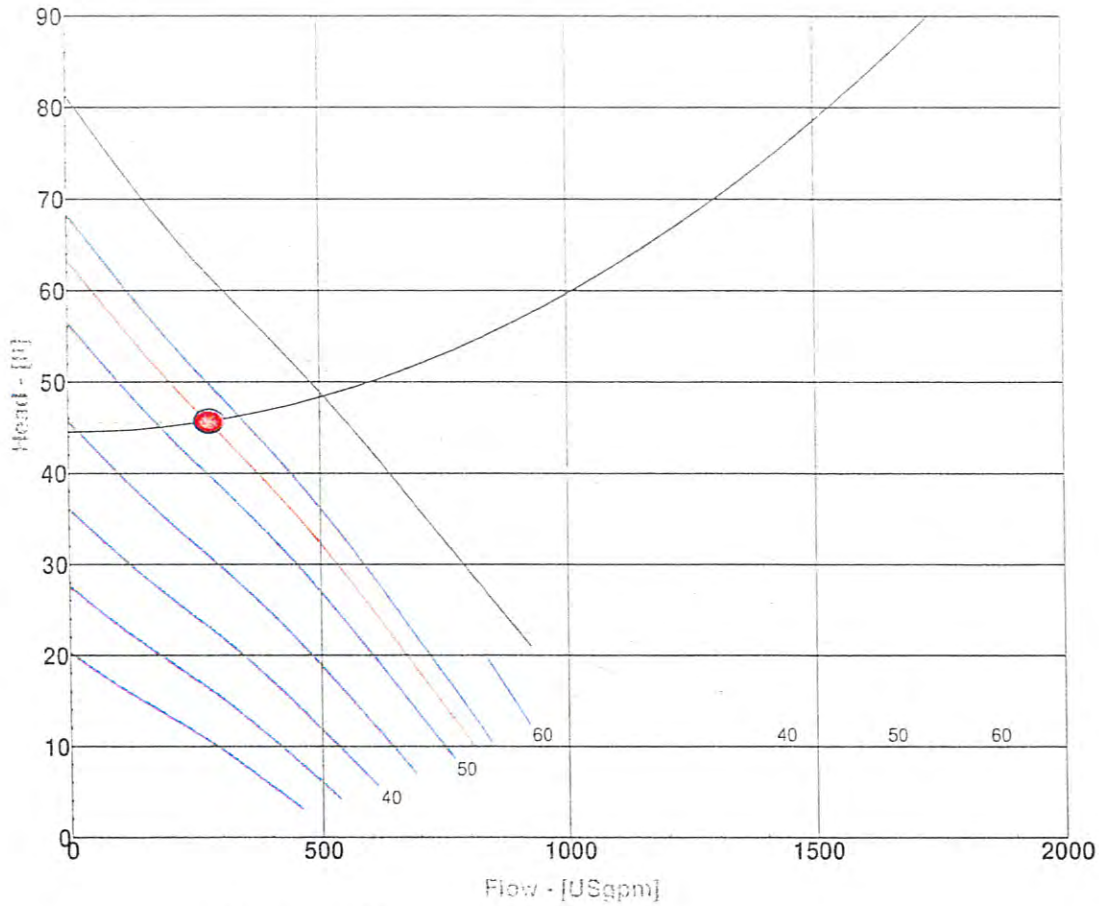
Overall eff: 52.4 %

Spec. energy: 311.0 kWh/Mg

VFD-Analysis - Performance

Project: Coos Bay Pump Station 4

Created by:: Jerek Hodge



Performance

Pump: N 3127 63-488-00-3702

PRODUCT DATA

Imp. diam.: 215 mm

Rtd. pwr.: 10 hp

Vanes: 2

Throughlet: 0 inch

Connection: Parallel

VFD connection: 1-VFD pump

No of pumps: 1

Frequency: 53 Hz

Flow: 280.0 USgpm

Head: 45.7 ft

Pwr cons.: 4.9 kW

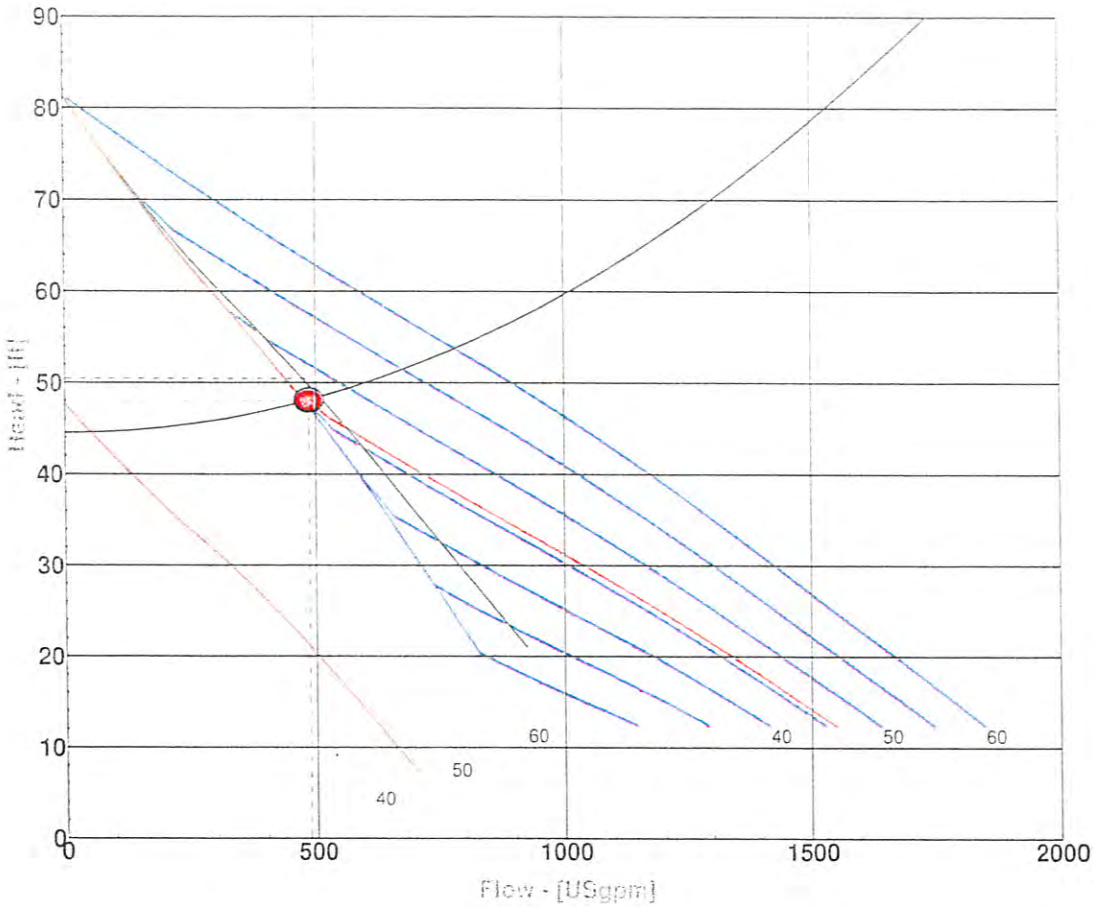
Overall eff: 49.2 %

Spec. energy: 291.6 kWh/Mg

VFD-Analysis - Performance

Project: Coos Bay Pump Station 4

Created by:: Jerek Hodge



Performance

Pump: N 3127 63-488-00-3702

PRODUCT DATA

Imp. diam.: 215 mm

Rtd. pwr.: 10 hp

Vanes: 2

Throughlet: 0 inch

Connection: Parallel

VFD connection: 1-VFD pump

No of pumps: 2

Frequency: 46 Hz

Flow: 486.9 USgpm

Head: 48.1 ft

Pwr cons.: 7.8 kW

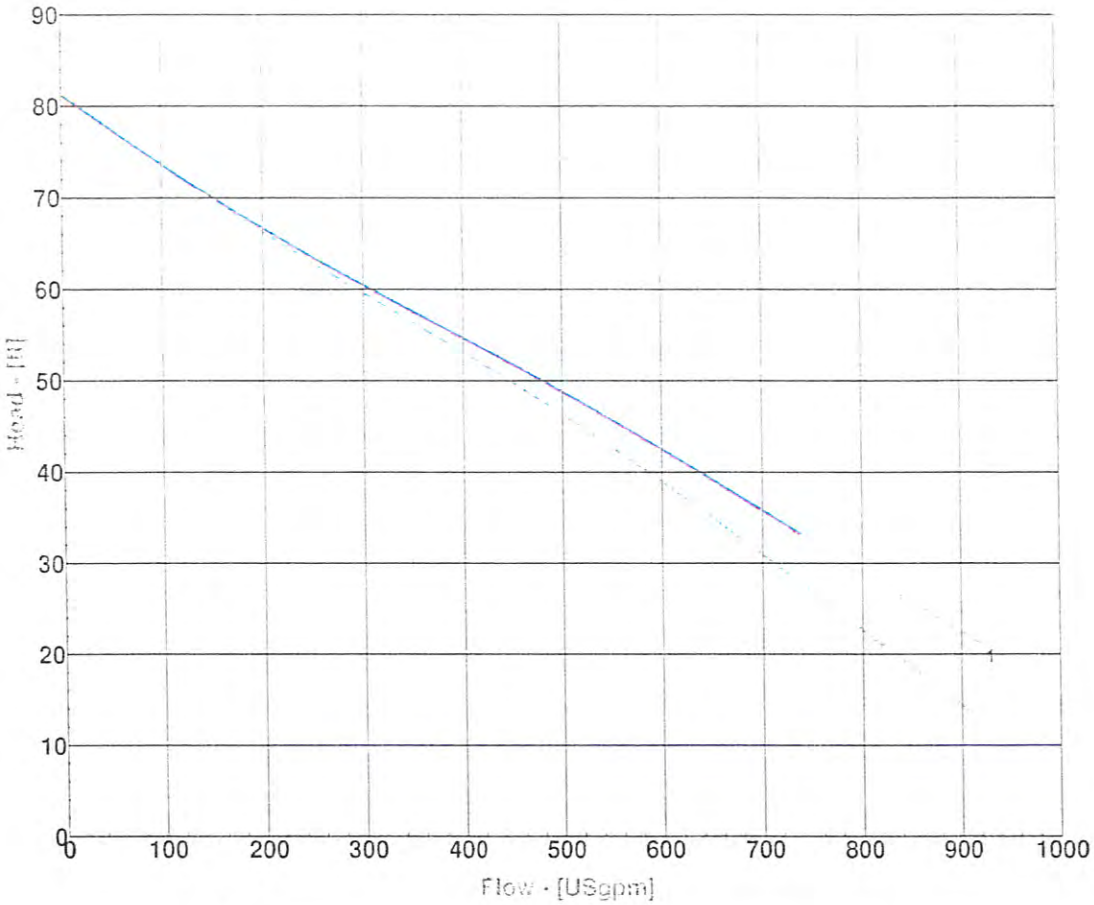
Overall eff: 56.3 %

Spec. energy: 268.3 kWh/Mg

Duty Analysis - Performance curves

Project: Coos Bay Pump Station 4

Created by:: Jerek Hodge



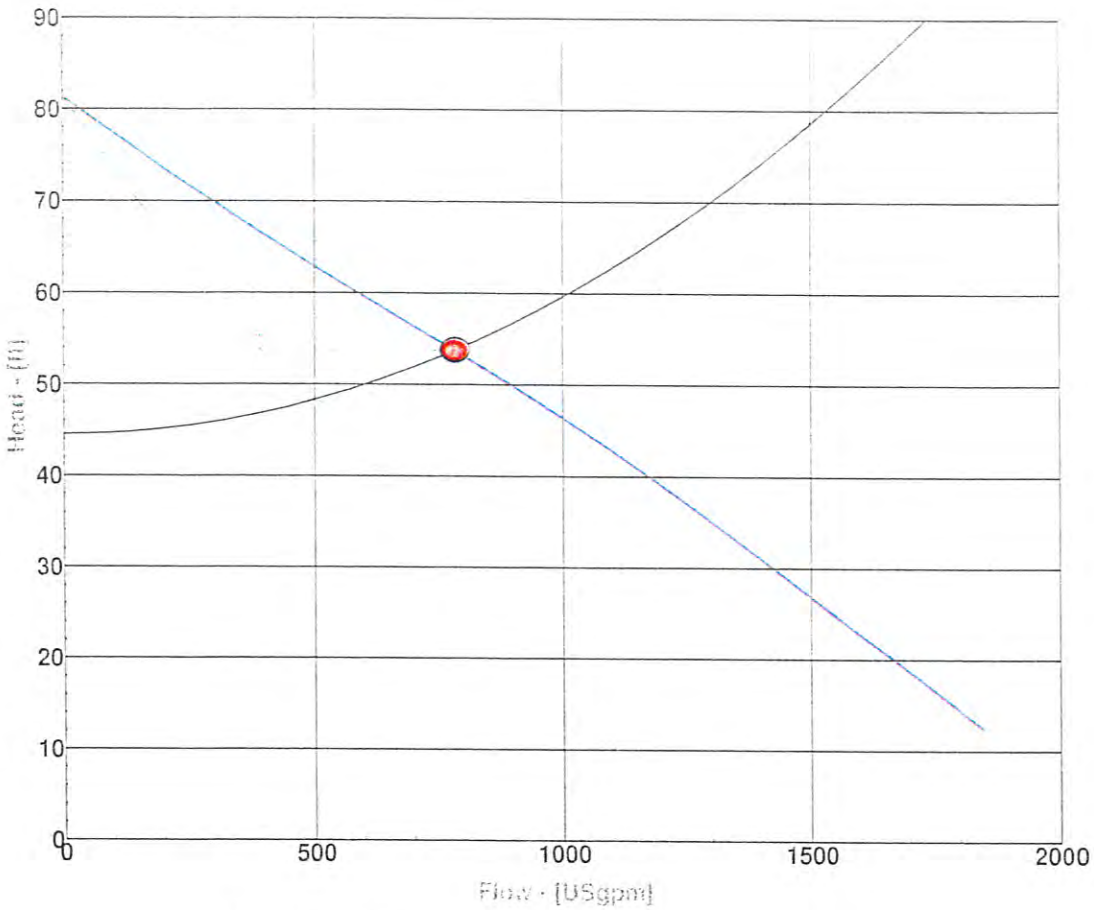
Performance

1. NP 3127 - 63-488-00-3702 10 hp 215 mm

Duty Analysis - Duty conditions

Project: Coos Bay Pump Station 4

Created by:: Jerek Hodge



2 NP 3127 63-488-00-3702

PRODUCT DATA

Rtd. pwr.: 10 hp

Imp. diam.: 215 mm

Vanes: 2

Throughlet: 0 inch

DUTY CONDITIONS

No of pumps: 2

Flow: 782.3 USgpm

Head: 55.3 ft

Reduced head: 53.8 ft

Shaft power: 16.2 hp

Pump efficiency: 67.6 %

Specifc energy: 301.4 kWh/mg

NPSHre: 13.0 ft

FLYGT

Rating

Frequency	60 Hz	Product	3127 . 095	Issue	1
Phases	3	Motor #	21-12-4AL	# of Starts/Hr	30
Poles	4	Rated power	10.0 hp	Issue date	
Approval	FM	Installations	JLPS	Valid from	6/21/2007
-	N	Type of duty	S1	Status	APPR

Rtd. amb. temp. 40 °C / 104 °F

	Alternative 1	*Alternative 2*		
Voltage	460 V	V	Stator variant	38
Connection	D		Speed	1745 r/min
Rtd. Curr.	13.0 A	A	Module	137
Starting current	75.0 A	A	Motor issue	11
Power factor	0.87			
NEMA code letter	A			

Warm liquid data Note! Reduced rated power

	°C / °F	°C / °F
Rtd. amb. temp.		
Rtd. Curr. (1)	A	A
Rtd. Curr. (2)	A	A
Max input power	kW	kW

ITT Water & Wastewater

PERFORMANCE CURVE

PRODUCT	TYPE
NP3127.095	HT

DATE	PROJECT	CURVE NO	ISSUE
2010-04-13	Coos Bay Pump Station 4	63-488-00-3702	3

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.87	0.83	0.75
EFFICIENCY	84.5 %	85.0 %	83.5 %
MOTOR DATA	---	---	---

RATED POWER	10	hp
STARTING CURRENT ..	75	A
RATED CURRENT ...	13	A
RATED SPEED	1745	rpm
TOT.MOM.OF INERTIA ...	0.054	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 215 mm

MOTOR #	STATOR	REV
21-12-4AL	38D	11

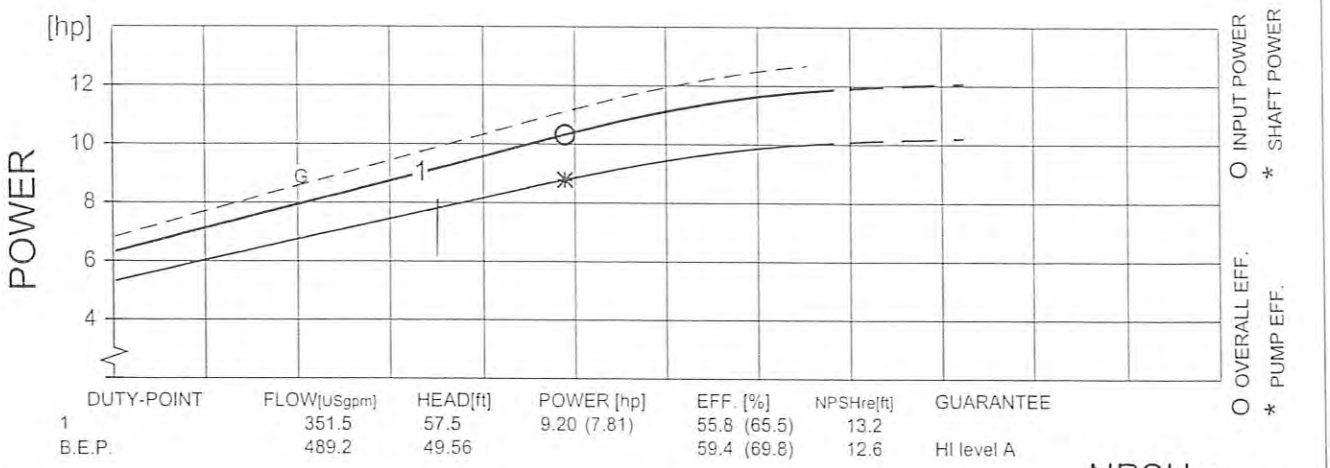
FREQ	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

GEARTYPE	RATIO
---	---

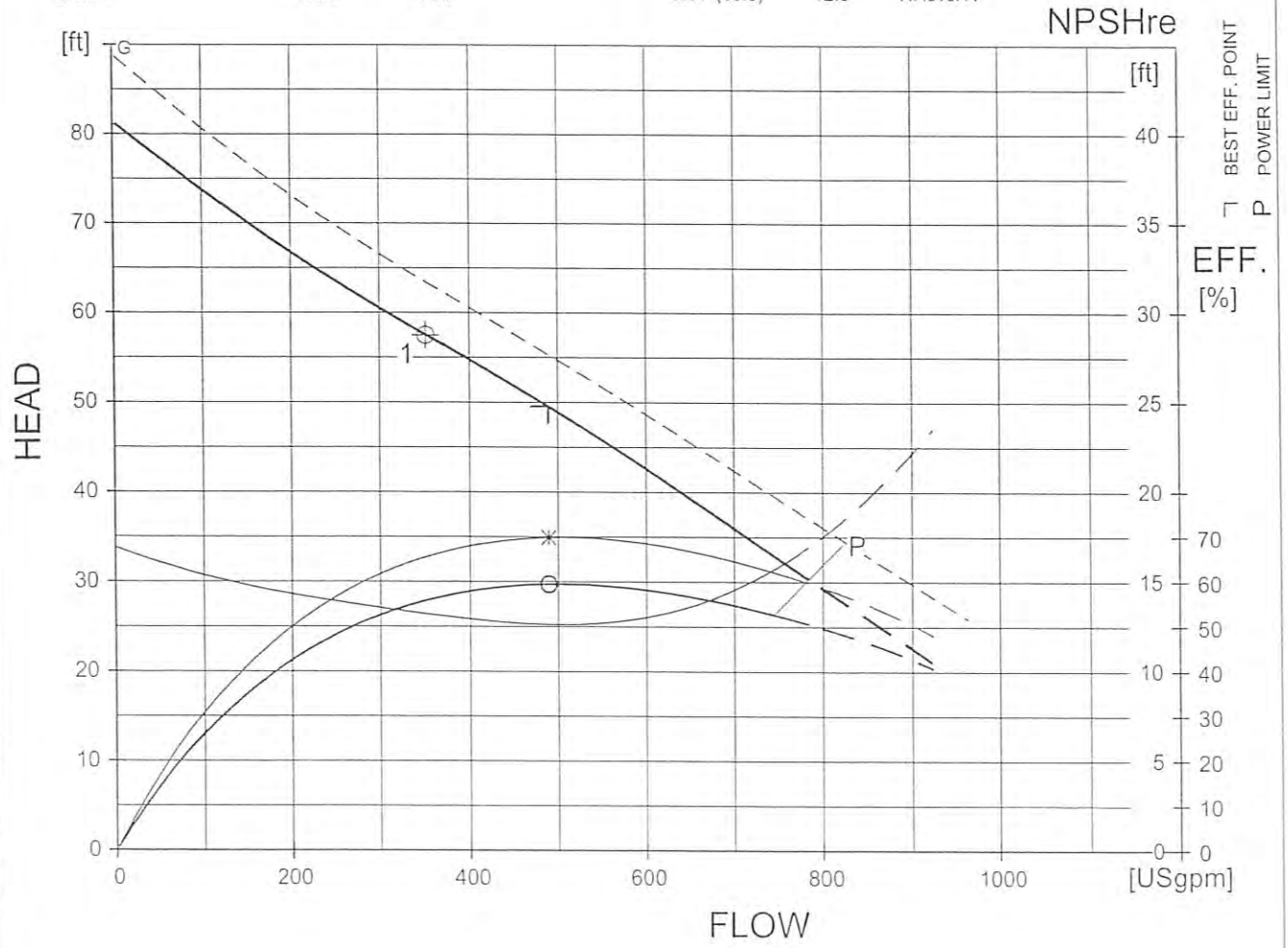
COMMENTS: HARD IRON™

INLET/OUTLET: -/ 4 inch

IMP. THROUGHLET: ---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]	GUARANTEE
1	351.5	57.5	9.20 (7.81)	55.8 (65.5)	13.2	
B.E.P.	489.2	49.56		59.4 (69.8)	12.6	HI level A



NPSHre = NPSH3% + min. operational margin

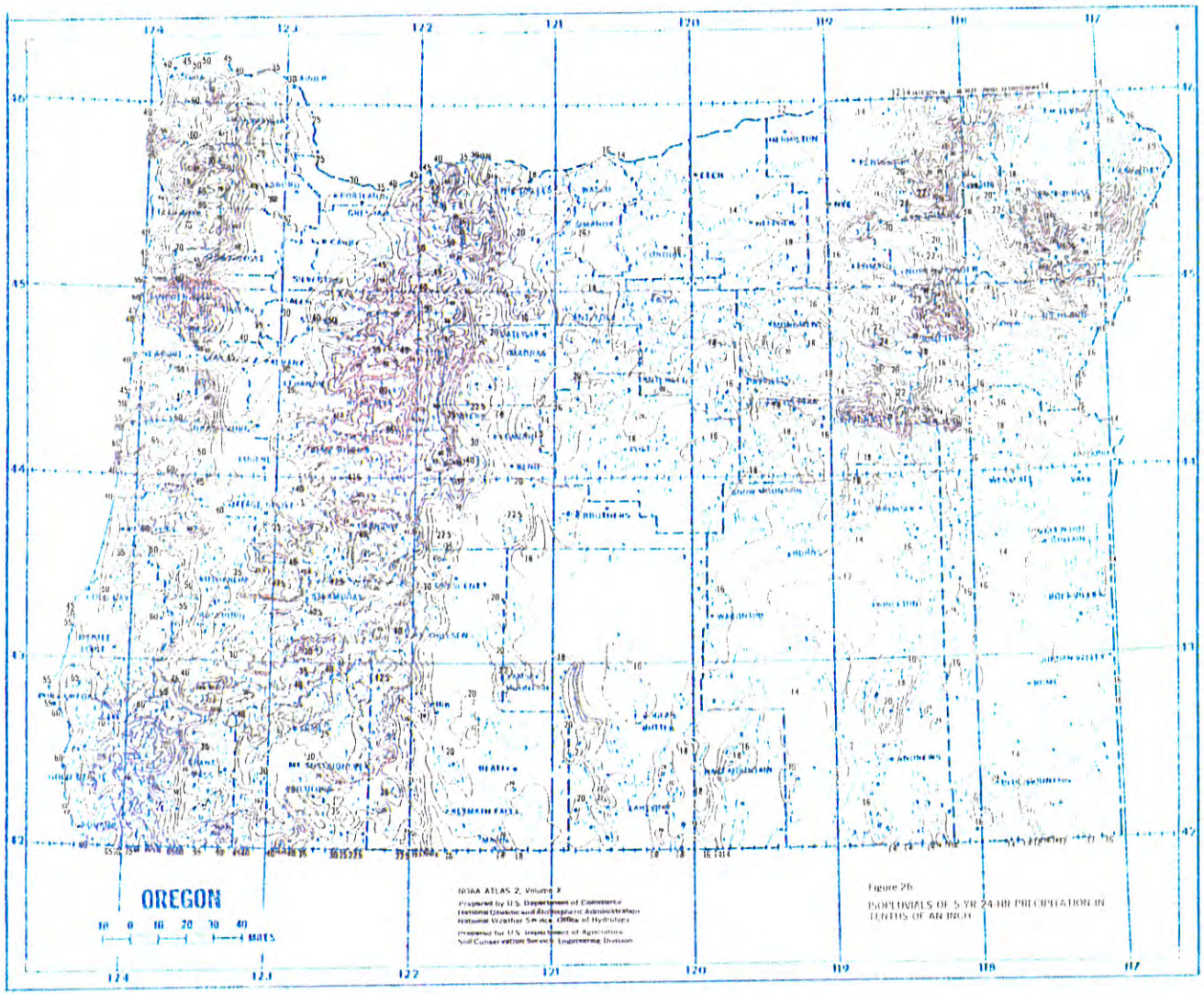
Performance with clear water and ambient temp 40 °C

GUARANTEE BETWEEN LIMITS (G) ACC. TO: HI level A

FLYPS3.1.6.5 (20090313)

APPENDIX C

ISOPOLLUVIAL MAP


OREGON
NOAA ATLAS 2, Volume X
Figure 26
ISOPLEVIALS OF 5 YR 24 HR PRECIPITATION IN TENTHS OF AN INCH

PROFESSIONAL SERVICES AGREEMENT
BETWEEN
CITY OF COOS BAY, OREGON
AND
[CONSULTANT]

THIS AGREEMENT FOR PROFESSIONAL SERVICES (the "Agreement") is made for a [TYPE OF SERVICES] of the [PROJECT NAME]as of the day of**,** 20, by and between **CITY OF COOS BAY, OREGON**, with offices located at **500 Central Avenue, Coos Bay, Oregon 97420** (hereinafter referred to as the "Owner") and [CONSULTANT NAME]**,** an(d) **Oregon** [Corporation/LLC/Partnership/Sole Proprietor] with offices located at [CONSULTANT ADDRESS] (hereinafter referred to as "Consultant"). (Owner and Consultant hereinafter collectively referred to as the "Parties").

IN CONSIDERATION of the mutual promises and covenants hereinafter set forth and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

ARTICLE 1 -- THE PRIME PROFESSIONAL

1.1 -- Consultant is the Prime Professional with respect to services to be performed under this Agreement and is responsible for coordinating services with the services of others involved in the Project. The Consultant is Owner's independent consultant for the Project and is solely responsible for methods and means used in performing Consultant's services under this Agreement, and is not an employee, agent, partner, or joint venture of the Owner.

ARTICLE 2 -- BASIC SERVICES AGREEMENT OF CONSULTANT SERVICES

2.1 -- The Base Services to be provided by the Consultant to the Owner under this Agreement are described in the **Basic Services Agreement** (Exhibit "A")

2.2 -- Consultant shall provide the Owner with the Services more specifically described in **Basic Services Agreement** (Exhibit "A") to include the Original Request for Qualification/Proposal (RFP/Q) with addendums (if applicable), Consultants Response to RFP/Q, Scope of Services, Project Schedule, Deliverables, List of Sub consultants, Project Fees and Certificates of Insurance. Consultant will be paid by Owner for the services rendered under this Agreement as indicated in Article 8 hereof. Consultant shall, at its own expense, obtain all data and information (other than that referred to in Article 4 hereof) necessary for the performance of its services.

2.3 -- Consultant shall provide a list of all sub consultants proposed to be used on this project. The owner reserves the right to approve the use of all sub consultants to work on this project. A list of approved sub consultants shall be included as a part of this Agreement.

2.4 -- Consultants list of approved sub consultants shall not be modified without the prior notice and agreement of the owner.

ARTICLE 3 -- AMENDMENT TO ORIGINAL AGREEMENT FOR ADDITIONAL CONSULTANT SERVICES

3.1 -- If authorized in writing by Owner, the Consultant shall furnish additional services pursuant to this Agreement, which are considered by Owner to be beyond the scope of the **Basic Services Agreement**. Additional services shall be documented by a separately authorized **Amendment to Original Agreement** (Exhibit "B") to include, the Scope of Services for Additional Work, Project Schedule (Revised), Additional Deliverables, Project Fees (increase/decrease) and Other Considerations.

3.2 -- Services provided under an **Amendment to Original Contract** shall be paid for by Owner as indicated in Article 8 of this Agreement hereof.

ARTICLE 4 -- OWNER'S RESPONSIBILITIES

4.1 -- Owner shall, with reasonable promptness, provide to Consultant available information regarding the requirements for the services.

4.2 -- Owner shall give prompt written notice to Consultant whenever the Owner observes or otherwise becomes aware of any development that affects the scope or timing of the Consultant's Services.

ARTICLE 5 -- PERIOD OF SERVICE

5.1 -- The services called for hereunder shall be completed no later than as indicated in the Basic Services Agreement, Project Schedule, and any Amendment(s) to Original Agreement, Project Schedule Revisions.

5.2 -- This Agreement shall remain in effect until **[DATE]**, unless terminated sooner as provided herein or extended by mutual agreement in writing.

5.3 -- Consultant shall give prompt written notice to Owner whenever Consultant observes or otherwise becomes aware of any development that will likely affect the scope or timing of Consultant's Services.

ARTICLE 6 -- COMPLIANCE WITH APPLICABLE LAW

6.1 -- Consultant certifies that it will comply with all federal, state and local laws, ordinances and regulations applicable to this Agreement, including, but not limited to all applicable requirements of federal and state civil rights and rehabilitation statues, rules and regulations, as well as all local ordinances and regulations pertaining to public contacting. Without in any manner limiting the foregoing, Consultant agrees that the provisions of ORS 279B.220, 279B.225, 279B.230, 279B.235 and 279B.270, ORS 279C.505, 279C.515, 279C.520 and 279C.530, shall apply to this Agreement, to the extent that such statutes are not inconsistent with local ordinances and regulations pertaining to public contracting. Further, that ORS Chapter 656, ORS 979.350 and/or USC Section § 276A, apply to Consultant's performance under this Agreement.

6.2 -- By signature on this Contract, Consultant hereby certifies that he is not in violation of any Oregon tax laws. For the purpose of this certification, "Oregon tax laws" includes, but may not be limited to, ORS Chapter 118, 119, 314, 316, 317, 318, 320, 321, and 323 and Sections 10 to 20, Chapter 533, Oregon Laws 1981, as amended by Chapter 16, Oregon Laws 1982 (first special session); the Homeowner's and Renters Property Tax Relief Program under ORS 310.630 to 310.690; and any local tax laws administered by the Oregon Owner of Revenue under ORS 305.620.

ARTICLE 7 -- REIMBURSABLE EXPENSES DEFINED

7.1 -- Reimbursable Expenses include actual expenses incurred by Consultant directly or indirectly in connection with the Project, such as expenses for printing or reproduction of Reports, Drawings, Specifications, Bidding Documents needed for public use and Postage. These expenses will be billed at cost plus 10% for handling.

ARTICLE 8 -- PAYMENTS TO CONSULTANT

8.1 -- Owner reasonably believes at the time of entering into this Agreement that sufficient funds are available and authorized for expenditure to finance the costs of this Agreement.

8.2 -- Owner shall pay Consultant for Basic Services, Amendment(s) to Original Agreement and Reimbursable Expenses on the basis set forth in this Agreement.

8.3 -- Consultant shall submit monthly two (2) copies of invoices to Owner for services rendered and reimbursable expenses incurred. If Owner fails to make any payment due the Consultant within sixty days after receipt of the invoices therefore, the amounts due will be increased at the rate of 1% per month on the unpaid monthly balance, from and after the sixtieth day after receipt. In addition, the Consultant may, after giving seven days written notice to Owner, suspend services under this Contract until the Consultant has been paid in full all amounts due for services, expenses and charges.

ARTICLE 9 -- AUTHORIZED REPRESENTATIVE

9.1 -- Owner's Authorized Representative for this Project is designated in this Agreement. All matters and correspondence pertaining to the Project, including submittal of monthly invoices, will be through Owner's Authorized Representative. Owner's Authorized Representative shall render decisions in a timely manner pertaining to documents submitted by Consultant in order to avoid unreasonable delay in the orderly and sequential progress of Consultant's Services.

9.2 -- Upon execution of this Agreement, Consultant will designate Consultant's Authorized Representative for the Project and convey the name of Consultant's Authorized Representative to Owner in writing. Consultant's Authorized Representative shall act on behalf of Consultant on all matters pertaining to this Project. All matters and correspondence to Consultant pertaining to the Project will be addressed through Consultant's Authorized Representative.

9.3 -- Consultant's Authorized Representative shall not be changed without the prior written notice to and agreement of Owner.

ARTICLE 10 -- PROJECT SCHEDULE/LIQUIDATED DAMAGES

10.1 -- The consultant is required to submit a project schedule showing work tasks, milestone dates and completion date. The Owner, who may request changes, will review the project schedule. With both Parties concurrence, the Project Schedule will become a part of this Agreement.

10.2 -- In event, the Consultant fails to complete work or misses a project milestone on or before the date agreed to in the project schedule, the Owner may assess liquidated damages.

10.3 -- Liquidated Damages will be assessed for each and every day the project milestone or work not contemplated under this Agreement remains uncompleted beyond the Project Schedule Date, the Consultant shall pay to the Owner the sum of $100.00 per calendar day as liquidated damages and not as a penalty. This sum may be deducted from money due or to become due to Consultant as compensation under this Agreement.

ARTICLE 11 -- TERMINATION

11.1 -- This Agreement may be terminated by either party by giving seven (7) days written notice in the event of substantial failure to perform in accordance with the terms herein by the other party through no fault of the party initiating the termination. If this Agreement is so terminated, Owner shall pay Consultant for services satisfactorily completed up to date of termination for said services.

ARTICLE 12 -- CONSULTANT'S RECORDS

12.1 -- For not less than three (3) years after the contract expiration date, the Owner, the State of Oregon, and their duly authorized representatives shall have access to the books, documents, papers, and records of the Consultant which are directly pertinent to this Agreement for the purpose of making audit, examination, excerpts, and transcripts. If for any reason, any part of this Agreement, or any resulting construction contract(s) is involved in litigation, Consultant shall retain all pertinent records for three years or until all litigation is resolved, whichever is longer. Full access will be provided to the Owner in preparation for and during litigation.

ARTICLE 13 -- USE OF DOCUMENTS AND ELECTRONIC DELIVERABLES.

13.1 -- All Documents are instruments of Service in respect to this Project, and the Owner shall retain an ownership and property interest therein (including the right of reuse at the discretion of the Owner) whether or not the Project is completed.

13.2 -- Copies of Consultant-furnished data that may be relied upon by Owner are limited to the printed copies (also known as hard copies) that are delivered to the Owner. Files in electronic media format of text, data, graphics, or of other types that are furnished by Consultant ("Electronic Deliverables") to Owner are only for convenience of Owner.

13.3 -- Electronic files of text, data, graphics, or other types ("Electronic Deliverables") that are furnished by Owner to Consultant are furnished for the convenience of Consultant. The Electronic Deliverables are subject to error and can be modified or corrupted without the knowledge or authorization of Owner. Therefore, in the event of any discrepancy between the Electronic Deliverables and the printed copies (the "hard copies") of the documents furnished to Consultant, the hard copies shall govern and Consultant's use of the Electronic Deliverables is at Consultant's own risk.

13.4 -- When transferring Electronic Deliverables, Owner makes no representations as to long-term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by Owner at the beginning of this Project.

13.5 -- Consultant acknowledges and agrees that all work and services performed under this Agreement shall be a "work made for hire" as that term is defined by the copyright laws of the United States. The Consultant hereby assigns all rights, title, and interest therein to the Owner. Except as otherwise provided herein, no rights, express or implied, are granted to the Consultant. Consultant may make and retain copies of Electronic Deliverables for information and reference in connection with use on the Project by Consultant. Such Electronic Deliverables are not intended or represented to be suitable for reuse by Consultant or others on extensions of the Project or on any other project. Owner retains ownership of all Documents and Electronic Deliverables and is providing such Documents and Electronic Deliverables for Consultant's use only for this Project. Consultant is not authorized to use, reuse, or modify the Documents or Electronic Deliverables for any other use or purpose. Any such reuse or modification without written verification or adaptation by Owner, as appropriate for the specific purpose intended, will be at Consultant's sole risk and without liability or legal exposure to Owner. Consultant shall indemnify and hold harmless the Owner from and against any and all claims, liabilities, losses, damages, or costs, including but not limited to reasonable attorney's fees, arising out of or in any way connected with the conversion, modification, misinterpretation, misuse or reuse, by Consultant or others, of Electronic Deliverables furnished by Owner hereunder.

13.6 -- Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of Owner's or Consultant's rights.

13.7 -- Consultant shall submit the Electronic Deliverables and related materials, if any, to the Owner as set forth in the Scope of Services.

13.8 -- Consultant agrees that it shall not publish, copyright or patent any of the data furnished in compliance with this Agreement, it being understood that such data or information is the property of Owner.

ARTICLE 14 -- INDEMNIFICATION

14.1 -- Consultant shall defend, indemnify, and hold the Owner, and its respective, officers, agents, and employees harmless from all suits, actions, claims, demands, judgments, and liabilities (including property damage and bodily injury or death) to the extent resulting from any negligent acts, errors or omissions of Consultant, its agents or employees, arising from or relating to this Agreement, including costs of litigation or arbitration and attorney's fees before trial, at trial, or on appeal.

14.2 -- Consultant shall defend, save, and hold harmless the Owner, its officers, agents, and employees, from all claims, suits, or actions of whatsoever nature, arising out of professional negligent acts, errors or omissions of Consultant or its employees, subcontractors, or agents in performance of professional services under this contract..

ARTICLE 15 -- INSURANCE

Specific Directives

1. General Liability shall be a per occurrence form and must cover the time for which the work is being performed.

2. Proof of insurance of not less than the amount required is to be provided. Written notice of cancellation of insurance shall be provided to the City/Agency not less than 30 days prior to the date of cancellation.

3. If the City/Agency is required to use Federal or State insurance policy limits, or is subject to the Federal or State tort claim limits, the limits required through this directive shall be superseded by such limits.

4. If a claim occurs where the amount of the claim exceeds the insurance policy limits required by this directive, the contractor assumes full responsibility for the payment of such claim.

5. Insurance policy limits shall not be less than those listed in this directive without the consensus of the City Manager, City Attorney and the City Risk Manger of Record. Insurance policy limits may be waived at the discretion of the City/Agency. Insurance policy limits may be required to be higher based upon the City Manager's review of the specific application for which the certificate is required.

6. Tail Coverage": If any of the required liability insurance is on a "claims made" basis, recipient shall maintain either "tail" coverage or continuous "claims made" liability coverage, provided the effective date of the continuous "claims made" coverage is on or before the effective date of the Contract/Agreement, for a minimum of 24 months following the later of:

   (1) Recipient's completion of all services and the City's/Agency's acceptance of all services required under the Contract/Agreement, or

   (2) The expiration of all warranty periods provided under the Contract/Agreement. Notwithstanding the foregoing 24-month requirement, if recipient elects to maintain "tail" coverage and the maximum time period "tail" coverage is reasonably available in the marketplace is less than the 24-month period described above, recipient shall maintain "tail" coverage for the maximum time period "tail" coverage is reasonably available in the marketplace for the coverage required.

7. Definitions:

Commercial General Liability: To cover bodily injury, death, and property damage. This insurance shall include contractual liability coverage for the indemnity provided under those listed in the Agreement/Contract, personal and advertising injury liability, products liability and completed operations liability. Coverage may be written in combination with Automobile Liability Insurance (with separate limits).

Professional Liability: To cover error, omission or negligent acts related to the professional services to be provided under the Agreement/Contract.

Automobile Liability: To cover each accident for bodily injury and property damage, including coverage for owned, hired, non-owned, leased, or rented vehicles as applicable. This coverage may be written in combination with the Commercial General Liability Insurance (with separate limits).

Builders Risk*:* To cover structures being built, temporary structures at the building site, and building materials not yet having become part of the building. The building materials are covered while on the insured location, in transit, or in storage at another location.

Installation Floater: To cover materials, equipment, and personal property while in transit, installation, and until coverage terminates according to the terms of the floater. This coverage can cover the property of others in the contractor's care, custody or control that is often excluded under the contractor's general liability coverage.

Umbrella Liability: To cover excess liability over several of the insured's primary liability policies. An excess liability policy may be what is called a following form policy, which means it is subject to the same terms as the underlying policies; it may be a self-contained policy, which means it is subject to its own terms only; or it may be a combination of these two types of excess policies. Umbrella policies provide three functions:

(1) To provide additional limits above the each occurrence limit of the insured's primary policies;

(2) To take the place of primary insurance when primary aggregate limits are reduced or exhausted; and

(3) To provide broader coverage for some claims that would not be covered by the insured's primary insurance policies, which would be subject to the policy retention.

Most umbrella liability policies contain one comprehensive insuring agreement. The agreement usually states it will pay the ultimate net loss, which is the total amount in excess of the primary limit for which the insured becomes legally obligated to pay for damages of bodily injury, property damage, personal injury, and advertising injury.

Level 4 Insurance Requirements: Professional Services contracts/agreements over $50,000:

Commercial General Liability Per occurrence	$ 1,000,000
Professional Errors and Omissions liability (Per occurrence)	$ 2,000,000
Workers' Compensation	Statutory Limit
Applicable Federal (e.g., Longshoremen's)	Statutory Limit
Employer's Liability	$ 500,000
Umbrella/Excess Insurance Per occurrence	$ 2,000,000
Automobile Liability Per occurrence	$1,000,000

8. Should the Umbrella/Excess Insurance coverage combined with Commercial General Liability coverage not equal or exceed the minimum combined coverage shown, coverage must be increased to equal or exceed the minimum total coverage limits shown. If there is no Umbrella/Excess Insurance coverage, then the Commercial General Liability, Employers Liability, and Automobile Liability limits must be increased to equal or exceed the minimum total coverage limits shown. The Certificate of Insurance(s) and Endorsement(s) will be a

part of the Contract and shall be provided to the City/Agency with endorsement(s) indicating that the Commercial General Liability insurance coverage is in effect which shall be primary and non-contributory with any insurance maintained by the City/Agency and include a per project aggregate (form CG 2503 05/09 or equivalent).

Such certificate(s) and endorsement(s) shall name the City/Agency as an additional insured commercial general liability, automobile liability, and umbrella liability policies. Copies of such endorsements or coverage enhancements **shall be attached to the certificate**. **A waiver of subrogation under the workers' compensation and commercial general liability policies shall be provided**. Thirty (30) days written notice shall be provided to the certificate holder prior to cancellation or significant modification of coverage. The Certificate of Insurance(s) and Endorsement(s) shall be provided to the City/Agency which will become a part of the Contract. Insurance Coverage provided must be underwritten by an insurance company deemed acceptable by the City/Agency. The City/Agency reserves the right to reject all or any insurance carrier(s) with an unacceptable financial rating.

Consultant will purchase and maintain property insurance for the entire work at the site on a replacement cost basis. Consultant shall obtain, at Consultant's expense, and keep in effect until final acceptance of the work performed under this contract, an Installation Floater or equivalent property coverage for materials, equipment, supplies, and tools to be used for completion of the work performed under this contract. The Installation Floater shall include coverage for testing, if applicable. The minimum amount of coverage to be carried shall be equal to the full amount of this contract. The Consultant will be responsible for any applicable deductibles.

9. Non-profits, community groups, and governmental entities that conduct meetings on city-owned property are exempt from the requirements of this administrative directive unless otherwise directed by the City Manager.

ARTICLE 16 -- CONTROLLING LAW/DISPUTES/COSTS

16.2 -- This Agreement, the rights and obligations of the Parties hereto, and any claims or disputes relating thereto shall be governed by, interpreted, construed and enforced in accordance with the laws of the State of Oregon.

16.3 -- Any litigation between the City and the Consultant arising out of or related to this Contract shall be brought and maintained solely and exclusively in the Circuit Court of Coos County, Oregon. Provided, if any litigation arising under this Contract must be brought in a federal forum, it shall be brought and maintained solely and exclusively in the United States District Court for the District of Oregon in Eugene, Oregon.

16.4 -- In the event a dispute shall arise under or about this Agreement, then the prevailing party therein shall be entitled to recover from the non-prevailing party all costs, expenses and attorneys' fees which may be incurred on account of such dispute, whether or not suit or other legal or quasi-legal proceedings may be brought, as well as at every stage of any such proceedings from the time such dispute first arises through trial, arbitration or other proceedings and all appellate processes.

16.5 -- In the event of any dispute relating to the enforcement, cancellation, performance, breach or

damages under or pursuant to the terms and conditions of this Agreement (excluding lien enforcement and foreclosure and a bond enforcement action), either party may demand arbitration of all such disputes if the dispute does not exceed $10,000. Any demand for arbitration must be made in writing and will be conducted in accordance with Oregon Laws. Discovery will be conducted under Oregon's Discovery Rules of Procedure. If the Parties cannot agree on an arbitrator, then the Presiding Judge for Coos County Circuit Court will appoint the arbitrator. The arbitration shall be carried out in Coos Bay, Oregon, at a place convenient to the arbitrators. The award by the arbitrator will be conclusive and it may be entered in any court of competent jurisdiction in accordance with Oregon Law. The cost of arbitration shall be shared equally by the Parties

ARTICLE 17 -- SUCCESSORS AND ASSIGNS

17.2 -- This Agreement shall be binding upon Owner and Consultant and their respective partners, successors, heirs, assigns, and legal representatives.

17.3 -- Consultant shall not assign, sublet or transfer any rights under or interest (including, but without limitation, monies that may become due or monies that are due) in this Agreement without the prior written consent of Owner. Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under this Agreement.

ARTICLE 18 -- FORCE MAJEURE

18.2 -- Neither party shall be held responsible for delay or default caused by fire, riot, acts of God, and war, which is beyond such party's reasonable control. Each party shall, however, make all reasonable efforts to remove or eliminate such a cause of delay or default and shall, upon the cessation of the cause, diligently pursue performance of its obligations under the Contract..

ARTICLE 19 -- NONDISCRIMINATION

19.2 -- Consultant agrees to comply with all local, state, and Federal laws and ordinances regarding discrimination in employment against any individual on the basis of race, color, religion, sex, national origin, physical or mental impairment, or age. In particular, Consultant agrees to comply with the provisions of Title 7 of the Civil Rights Act of 1964, as amended, and applicable Executive Orders, including, but not limited to, Executive Order No. 11246.

ARTICLE 20 -- ACCURACY OF WORK PRODUCT

20.2 -- Consultant warrants that its services under this Agreement shall be performed in a thorough, efficient and competent manner, promptly and with due diligence and care, and in accordance with the standard of care of the profession.

20.3 -- If any part of Consultant's work is found to be defective for reasons attributable to Consultant, Consultant shall re-perform, at its own expense, those aspects of the work found defective.

20.4 -- Consultant is solely responsible to Owner for correcting errors resulting from Consultant's faulty or inaccurate performance.

ARTICLE 21 -- SEVERABILITY

21.2 -- If any provision of this Agreement or any application thereof to any person or circumstances shall, to any extent, be invalid, the remainder of this Agreement or the application of such provision to persons or circumstances other than those as to which it is held invalid shall not be affected thereby and each provision of this Agreement shall be valid and enforced to the fullest extent permitted by law.

ARTICLE 22 -- NOTICES

22.2 -- Any and all notices required or authorized to be given pursuant to this Agreement, shall be given in writing and either hand-delivered, sent by facsimile or addressed and sent by certified or registered mail, postage prepaid, and return receipt requested, as follows:

If to Owner: CITY OF COOS BAY
500 Central Avenue
Coos Bay, Oregon 97420
Attention: **Jim Hossley, Director**
Public Works & Development

If to Consultant: _____

_____

_____

ARTICLE 23 -- ENTIRE AGREEMENT

23.1. This Professional Services Agreement with Basic Services Agreement (Exhibit "A") together with any future, separately authorized Amendment(s) to Original Agreement (Exhibit "B") issued hereunder, constitutes the entire and integrated Professional Services Agreement between the Owner and Consultant and supersedes all prior negotiations, representations or agreements, either written or oral.

23.2. The terms of this Agreement shall not be waived, altered, modified, supplemented, or in any manner whatsoever, except by written instrument. Such waiver, alteration, modification, supplementation, or amendment, if made, shall be effective only in the specific instance and for the specific purpose given, and shall be valid and binding only if it is signed by all parties to this Contract. The failure of the Owner to enforce any provision of this Contract shall not constitute a waiver by the Owner of that or any other provision.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be executed by their duly authorized representatives, under seal, as of the day and year first above written.

"OWNER"	**"CONSULTANT"**
CITY OF COOS BAY, OREGON	**[CONSULTANT NAME]**
By:	By:
Typed Name: JIM HOSSLEY	Typed Name:
Title: PUBLIC WORKS AND DEVELOPMENT DIRECTOR	Title:
Date:	Date:

[CORPORATE SEAL]

Exhibit "A"
BASIC SERVCIES AGREEMENT

[CONSULTANT NAME], an(d) **[STATE] [Corporation/LLC/Partnership/Sole Proprietor]** (hereinafter "Consultant") agrees to provide the following Professional Services (hereinafter "Basic Services") for **CITY OF COOS BAY** (hereinafter "Owner"), in accordance with the terms and conditions of this Professional Services Agreement, dated **[MONTH][DAY]**, 20__, **[TYPE OF SERVICES] [PROJECT NAME]** all of which terms and conditions are incorporated herein by reference:

Part 'A' -- Original Request for Proposal/Qualifications (RFP/Q):

Part 'B' -- Consultants Response to Request for Proposal/Qualifications:

Part 'C' -- Project Schedule:

(The Consultant shall attach a Project Schedule to Part 'C', which will become a part of this Professional Services Agreement)

Part 'D' -- Deliverables:

(The Consultant shall attach a Project Deliverables List with dates to Part 'D', which will become a part of this Professional Services Agreement)

Part 'E' -- List of Sub consultants:

(The Consultant shall attach a List of Sub consultants to Part 'E', which will become a part of this Professional Services Agreement)

Part 'F' -- Project Fees:

(The Consultant shall attach a Project Fee proposal to Part 'F', which will become a part of this Professional Services Agreement)

Part 'G' -- Certificate of Insurance:

(The Consultant shall attaché all Certificate of Insurance(s) & Endorsement(s) to Part 'G', which will become a part of this Professional Services Agreement)

Exhibit "B"
AMENDMENT NO. X
TO
ORIGINAL AGREEMENT

[CONSULTANT NAME], an(d) **[STATE]** **[Corporation/LLC/Partnership/Sole Proprietor]** (hereinafter "Consultant") agrees to perform and complete the following work (hereinafter "Work") for **CITY OF COOS BAY** (hereinafter "Owner"), in accordance with the terms and conditions of the Professional Services Agreement, dated **[MONTH][DAY], 20__, [TYPE OF SERVICES] [PROJECT NAME]**all of which terms and conditions are incorporated herein by reference:

Part 'A-X' – Scope of Services for Additional Work:

(The Consultant shall attach a Scope of Services for Additional Work to Part 'A-X', which will become a part of the above referenced Professional Services Agreement)

Part 'B' -- Project Schedule:

(The Consultant shall revises the Project Schedule and attach to Part 'C' of the above referenced Professional Services Agreement and will become a part of that Agreement)

Part 'C' – Deliverables:

(The Consultant shall revise the Project Deliverables List with dates and attach to Part 'D' of the above referenced Professional Services Agreement and will become a part of that Agreement)

Part 'D' -- Project Fees (increase/decrease):

(The Consultant shall revise the Project Fees and attach to Part 'F' of the above referenced Professional Services Agreement and will become a part of that Agreement)

"OWNER"	**"CONSULTANT"**
CITY OF COOS BAY, OREGON	**[CONSULTANT NAME]**
BY:	BY:
Typed Name: JIM HOSSLEY	Typed Name:
Title:PUBLIC WORKS AND DEVELOPMENT DIRECTOR	Title:
Date:	Date:

PART 'A'
ORIGINAL REQUEST FOR QUALIFICATIONS

PART 'B'
CONSULTANT STATEMENT OF QUALIFICATIONS

PART 'C'
PROJECT SCHEDULE

(The Consultant shall attach a Project Schedule to Part 'C', which will become a part of this Professional Services Agreement)

Revision	**Date**

PART 'D'
DELIVERABLES

(The Consultant shall attach a List of Project Deliverables with dates to Part 'D', which will become a part of this Professional Services Agreement)

PART 'E'
LIST OF SUB CONSULTANTS

(The Consultant shall attach a List of Sub consultants to Part 'E', which will become a part of this Professional Services Agreement)

PART 'F'
PROJECT FEE

(The Consultant shall attach a Project Fee proposal to Part 'F', which will become a part of this Professional Services Agreement)

PART 'G'
CERTIFICATE OF INSURANCE

(The Consultant shall attaché all Certificate of Insurance(s) & Endorsement(s) to Part 'G', which will become a part of this Professional Services Agreement)

City of Coos Bay

Coos County, Oregon

CONTRACT DOCUMENTS

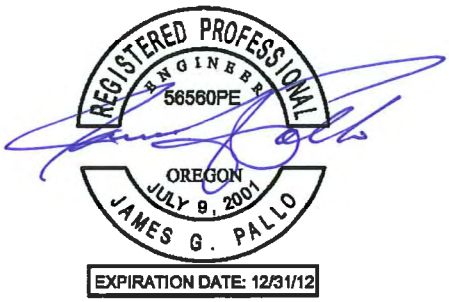
FOR THE CONSTRUCTION OF:

PUMP STATION 4

SCHEDULE I: Pump Station No. 4 Replacement

SCHEDULE II: New Gravity Sewer Line and Force Main

August, 2011
City Project No. 09/10-002
Engineers Project No.1201-022



Civil West
Engineering Services, Inc.

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SECTION 00100 - INVITATION FOR BIDS

Sealed bids for the construction of the Collection System Improvement Projects for the City of Coos Bay, Coos County, Oregon (Owner) will be received by Jennifer Wirsing, Engineering Service Coordinator, at City Hall, located at 500 Central Avenue, Coos Bay, OR 97420, until **2:00 p.m., xxx xx, 2011.** Bids will be opened publicly and read aloud immediately following the specified closing time. Subcontractor declarations must be submitted to the above-mentioned City representative no later than **4:00 p.m. on xxx xx, 2011.**

The work under this Contract is for public work and shall be broken into Schedules and awarded separately or together or any combination thereof. A brief description of the scope of work for each Schedule is provided below:

Basic Bid – Schedule I – Pump Station No. 4 Replacement shall take place within the easement south of Anderson Avenue and north of Blossom Gulch Creek. Demolition of existing station shall take place on 10th Street, adjacent to Blossom Gulch Elementary School.

i. Furnish and install new precast concrete wetwell, valve vault and flow meter vault. Wetwell will be 7-foot inside diameter and approximately 23 feet deep.
ii. Furnish and Install 6-inch and 8-inch ductile iron pipe, valves, fittings, and flow meter.
iii. Furnish and Install new manholes and pipe to convey sewage to new wetwell.
iv. Furnish and Install three submersible centrifugal pumps, guide rails, VFDs, controls and appurtenances.
v. Construct new CMU electrical/control building and concrete flatwork.
vi. Furnish and install stationary generator and automatic transfer switch.
vii. Perform site work including raising the site above floodplain and a new retaining wall. Provide AC pavement and crushed rock surfaces. Furnish and Install chain link perimeter fence.
viii. Connection to new 8-inch HDPE forcemain.
ix. Demolition of existing wetwell, drywell, control building, forcemain and influent pipe. Conversion of portion of gravity line to building lateral.
x. Electrical installation including buried conduit, power and control wire, panels, power supply and other as required for a complete and operational installation.
xi. Temporary pumping facilities as required to maintain operation of existing pump station during construction.

Basic Bid – Schedule II - New Gravity Sewer Line and Force Main construction shall take place along a portion an easement between 10th Street and vacated 11th Street. Force main will continue north under 11th Street easement, across Anderson Avenue and terminate at the existing manhole at the intersection of 11th Street and an alley.

i. Furnish and install approximately 335 lineal feet of 12-inch 3034 PVC sanitary sewer piping and 58 lineal feet of 12-inch 30304 PVC storm sewer piping . Complete installation shall include, but is not limited to: trench excavation, connection to existing systems and complete testing of facilities.
ii. Furnish and install approximately 465 feet of 8-inch HDPE pressure piping. Complete installation shall include, but is not limited to: trench excavation, connection to existing systems and complete testing of facilities.
iii. Installation of 3 new sanitary manholes and rehabilitation of discharge manhole.
iv. Restoration of ac pavement and landscape under easements, 11th Street and Anderson Avenue.
v. Temporary pumping facilities as required to maintain sewer service during construction.

All work for each Schedule under this Contract must be substantially completed within one hundred and eighty **180** days of the Notice to Proceed. If Bidder is awarded more than one schedule all work must be substantially completed within one hundred and eighty **180** days of the Notice to Proceed.

All pre-Bid questions shall be submitted in writing and shall be directed to Jennifer Wirsing, Engineering Service Coordinator of Coos Bay no later than five (5) days prior to the Bid opening.

Bidding documents may be examined at the office of Civil West Engineering Services, Inc. at the following location: (Note: Contact Engineer's office to purchase plans)

Engineer's Office: 486 E Street
Coos Bay, OR 97420
(541)266-8601
(541)266-8681 fax

Documents can also be examined at the following location(s):

Coos Bay City Hall, 500 Central Ave, Coos Bay, OR 97420
And on-line at: http://www.coosbay.org

Bidders must purchase Bidding Documents from the Engineer and be listed on plan holders list to bid. One copy of the Bidding documents, including specifications and drawings, may be obtained from the Engineer's design office with a non-refundable payment of **$90.00** per set payable to Civil West Engineering Services, Inc.

A pre-bid conference will be held for this project. All Bidders are encouraged however to visit the individual sites to help familiarize themselves with each project and project location.

Bids will be received as a combination of unit price and lump sum bid items. No bid will be considered unless fully completed and shall be submitted intact as the Bid (intact is further defined as "bound in the original binding, in the original order and with all of the original contents") and shall be accompanied by a bid security executed in favor of the Owner in the amount not less than 10% of the total amount of the bid. Bid security is to be forfeited as fixed and liquidated damage should the bidder neglect or refuse to enter into a contract and provide suitable insurance certificates, bond and other required documents for the faithful performance of the work in the event bidder is awarded the contract.

All bidders must be "equal opportunity employers" and comply with the appropriate provisions of state and federal law. In addition, all bidders are required to comply with ORS 656.017 regarding workers' compensation. Bidder, Contractor, and Subcontractors are required to be registered with Construction Contractors Board. Bidder, Contractor and Subcontractors are not required to be licensed under ORS 468A.720 for asbestos abatement.

Pursuant to ORS 279C.505(2), all Bidders must certify with their bids that they have an employee drug-testing program in place. If awarded a contract, Bidder must provide proof of such drug-testing program when executed Agreements are returned to Owner.

This contract is for public work and is subject to ORS 279C.800 to 279C.870. Prevailing wage rates for public works' contracts in Oregon are required for this project. No bid will be received or considered by the Owner unless the bid contains: 1) a statement that bidder will comply with the provisions of ORS 279C.840; 2) a statement as to whether the bidder is a resident bidder as defined in ORS 279A.120.

Before starting work, the contractor and every subcontractor employed under this contract is required to have a public works bond filed with the Construction Contractors Board, in accordance with ORS 279C.830 (3), unless the contractor or subcontractor is exempt under ORS 279C.836 (4), (7), (8), or (9).

Upon award of this contract, the Owner is required to pay a fee to the BOLI Prevailing Wage Rate Unit in accordance with ORS 279C.830 (2) and OAR 839-025-0200. The amount of the fee shall be one tenth of one percent (.001) of the contract price; however, the fee must be no less than $250 or more than $7,500 regardless of the contract price.

The Owner may reject any bid not in compliance with all prescribed public bidding procedures and requirements and may, for good cause, reject any and all bids upon a finding of the Owner that it is in the public interest to do so. No bidder may withdraw or modify a bid after the hour set for the receipt of bids, and thereafter until the lapse of 70 days after the bid opening.

Dated this xx day of xxx 2011.

By order of: Mr. Rodger Craddock

Title: City Manager

Published:

Published: xxx xx, 2011 Daily Journal of Commerce
xxx xx, 2011 The World Newspaper

INSTRUCTION TO BIDDERS

ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:

A. **General Conditions** – Section 007200 of the City of Coos Bay, Part 3 – Construction Specifications (Draft). Document is available from the City of Coos Bay at:
http://www.coosbay.org/cb/departments/documents/Draft-EngDesign-ConstStandards-Combined_000.pdf

B. Bidder--The individual or entity who submits a Bid directly to OWNER.

C. Issuing Office--The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered. Unless otherwise stated, the Issuing Office will be the office of the ENGINEER.

D. Contract and Bidding Documents – Includes all material bound herewith, together with any materials referenced herein including Bid Forms, Contract Documents, Bonds, etc. Technical specifications are bound in Volume 2 and shall supercede those required in the City of Coos Bay, Part 3- Construction Specifications (Draft); except when there is no equivalent specification in Volume 2, then the Draft Specifications shall be used.

E. Responsive Bidder – A Bidder who fully complies with the requirements and instructions in the Bidding Requirements and who fully completes all forms and other requested information.

F. Successful Bidder--The lowest responsible Bidder submitting a responsive Bid to whom OWNER (on the basis of OWNER's evaluations as hereinafter provided) makes an award.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement or Invitation to Bid may be obtained from the Issuing Office. The deposit on Bidding Documents is non-refundable.

2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 OWNER and ENGINEER in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 All bidders must have a current and valid Contractor's license in the state where the project is being undertaken.

3.02 Bidders must pre-qualify for this project.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 Subsurface and Physical Conditions

A. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents include the following:

B. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Bidding Documents.

C. Copies of reports and drawings referenced in paragraph 4.01.A will be made available by OWNER to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 3.02 of the General Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 Underground Facilities

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to OWNER and ENGINEER by owners of such Underground Facilities, including OWNER, or other.

4.03 Hazardous Environmental Conditions

A. Those reports and drawings relating to a Hazardous Environmental Condition identified at the Site that ENGINEER has used in preparing the Bidding Documents include the following:

1. None

B. Copies of reports and drawings referenced in paragraph 4.03.A will be made available by OWNER to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 3.06 of the General Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in paragraphs 3.02, 3.03, and 3.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in paragraph 3.06 of the General Conditions.

4.05 On request, OWNER will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.06 Reference is made to Article 6 of the General Conditions for the identification of the general nature of other work that is to be performed at the Site by OWNER or others (such as utilities and other prime contractors) that relates to the Work for which a Bid is to be submitted. On request, OWNER will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

4.07 It is responsibility of each Bidder before submitting a Bid to:

A. Examine and carefully study the Bidding Documents, including any Addenda and the other related data identified in the Bidding Documents;

B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. Become familiar with and satisfy Bidder as to all Federal, State, and local Laws and Regulations that may affect cost, progress, or performance of the Work;

D. Carefully study all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified herein as provided in paragraph 3.02 of the General Conditions, and carefully study all reports and drawings of a Hazardous Environmental Condition, if any, at the Site which have been identified herein as provided in paragraph 3.06 of the General Conditions;

E. Obtain and carefully study (or assume responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

G. Become aware of the general nature of the work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

I. Promptly give ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by ENGINEER is acceptable to Bidder; and

J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in Bidding Documents and the written resolutions thereof by ENGINEER are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

5.01 A pre-bid conference will be held for this project. Questions or issues related to the project should be directed to the Engineer. Prospective Bidders are required to make their own arrangements for visiting the site.

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by CONTRACTOR.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to ENGINEER in writing at least ten (10) calendar days prior to the receipt of bids. Interpretations or clarifications considered necessary by ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by ENGINEER as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by OWNER or ENGINEER.

7.03 No addenda will be issued later than five (5) days prior to the date for receipt of bids except an addendum, if necessary, postponing the date for receipt of bids or withdrawing the request for bids.

7.04 Requests to clarify the source of materials, equipment suppliers, or any other such matter which does not modify, change, increase, or decrease the scope of work may be answered by the ENGINEER up to the date of the bid opening. No written responses will be made for these items.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to OWNER in an amount of ten (10) percent of Bidder's maximum Bid price and in the form of a certified or bank check or a Bid Bond (attached in Section 00431) issued by a surety meeting the requirements of paragraphs 4.01 and 4.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to furnish the required Contract Attachments and to execute and deliver the Agreement as specified in Article 20 and 21 of these Instructions to Bidders, OWNER may annul the Notice of Award and the Bid security of that Bidder will be Forfeited.

8.03 The Bid security of other Bidders whom OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER during the period that the Bid remains open whereupon Bid Security furnished by such Bidders will be returned.

8.04 Bid security of other Bidders whom OWNER believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) Substantially Completed and (b) also completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 -LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or "or-equal" materials and equipment as defined in paragraph 5.05 of the General Conditions, or those substitute or materials and equipment approved by the ENGINEER and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or "or-equal" item. Request for ENGINEER's clarification of materials and equipment considered "or-equal" prior to the Effective Date of the Agreement must be received by the ENGINEER at least 5 days prior to the date for receipt of Bids.

11.02 No substitution of materials, equipment, or methods for those specified will be allowed prior to bid opening on this project. Substitutions may be allowed after the effective date of the Agreement. All provisions set forth in paragraph 5.05 "Substitutes and Or-Equals" of the General Conditions as well as the applicable sections of the Technical Specifications concerning the requirements and conditions of substitution approval shall be followed.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 Bidder shall list subcontractors on the Proposed Subcontractor List, sign and submit the completed form to OWNER within two working hours of the time and at the place for receipt of Bids as identified in the Advertisement for Bids. Criteria for listing subcontractors and suppliers are as follows:

A. Only public improvement projects with a total contract value in excess of $100,000 are required to list first tier subcontractors.

B. Only first tier subcontractors need to be listed.

C. Any first tier subcontractor that will be furnishing labor or labor and materials on the Bid, if awarded, whose subcontract value would be equal to or greater than:

   1. Five percent of the total Bid amount, but at least $15,000; or

   2. $350,000, regardless of the percentage of the total Bid amount.

D. If there are no subcontractors who meet the criteria stated 12.01 A, B and C above, Bidder must state "none" on the form provided and submit it to OWNER as stated in 12.01 above.

E. The Proposed Subcontractor List form must be submitted separately. The form may be submitted with the bid or anytime within two working hours of the bid submittal time.

F. Failure to submit the Proposed Subcontractor List in accordance with the instructions in this Article 12 will result in the Bid being rejected as non-responsive.

12.02 Due to the specialized nature of the project, a subcontractor may be allowed to undertake a value of work that exceeds 50% of the total Bid Amount.

12.03 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.

ARTICLE 13 - PREPARATION OF BID

13.01 All blanks on the Bid form shall be completed by printing in ink or by typewriter and the Bid signed. A Bid price shall be indicated for each section, Bid item, alternative, adjustment unit price item, and unit price item listed therein, or the words "No Bid," "No Change," or "Not Applicable" entered. Any interlineations, alteration or erasure on the Bid Form must be initialed by the signer of the Bid.

13.02 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. If required by State where work is to be performed, the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

13.03 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

13.04 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

13.05 A Bid by an individual shall show the Bidder's name and official address.

13.06 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid form. The official address of the joint venture must be shown below the signature.

13.07 All names shall be typed or printed in ink below the signatures.

13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form.

13.09 The address and telephone number for communication regarding the Bid shall be shown.

13.10 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number for the state of the Project, if any, shall also be shown on the Bid form.

ARTICLE 14 - BASIS OF BID; EVALUATION

14.01 Unit Price

A. Bidders shall submit a Bid on a unit price basis or lump sum for each item of Work listed on the Bid Form. The Total Bid will be considered as the total bid amount for the project.

B. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

ARTICLE 15 - SUBMITTAL OF BID

15.01 Each prospective Bidder is furnished one copy of the Bidding Documents found bound herein and includes all Bid Forms, Bid Security, and Supplements to Bid Forms completed as instructed and required. All Bidding Documents shall be submitted **intact** as the Bid. (Intact is further defined as "bound in the original binding, in the original order, and with all the original contents.")

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement or Invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the

Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed as stated in the Invitation to or Advertisement for Bids.

15.03 Oral, telephonic, telephonic facsimile (FAX) or telegraphic bids are invalid and will not be accepted or receive consideration.

15.04 Bids received after the time indicated in the Invitation to or Advertisement for Bids will not be accepted for receive consideration.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 No bidder may withdraw or modify its bid after the time set for the receipt of bids, and thereafter during the period the bids remain open.

ARTICLE 17 - OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the Advertisement for Bids and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders within a reasonable amount of time after the opening of Bids.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid form, but OWNER may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 - AWARD OF CONTRACT

19.01 OWNER reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. OWNER further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. OWNER also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, OWNER will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bidders, OWNER will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be

submitted. Operating costs, maintenance costs, maintenance considerations, performance data, and guarantees of materials and equipment may also be considered by the OWNER.

19.05 OWNER may conduct such investigations as OWNER deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the contract Documents.

19.06 OWNER reserves the right to reject the Bid of any Bidder who does not pass any such evaluation to OWNER's satisfaction.

19.07 If the Contract is to be awarded, OWNER will award the Contract to the responsible Bidder whose total Bid, conforming to all material terms and conditions contained in these bidding documents is lowest, price and other factors considered. For projects with multiple schedules of work, separate Contracts will be awarded for each schedule. A Bidder may submit a Bid for any or all schedules. A Contract for multiple schedules may be awarded to a single Bidder if the Bid submitted is the lowest responsible Bid for each separate schedule.

19.08 If the Contract is to be awarded, OWNER will give the Successful Bidder a Notice of Award within 60 calendar days of the Bid opening.

19.09 Any protest of award must be filed with the OWNER within five (5) calendar days after the bids are opened and read.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

20.01 Article 4 of the General Conditions sets forth OWNER's requirements as to Performance Bond and Payment Bond. When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by such Bonds.

20.02 Article 4 of the General Conditions sets forth insurance requirements. When the successful Bidder returns the executed Agreement to OWNER for OWNER signature, it shall be accompanied by certificates of insurance (and other evidence of insurance requested by OWNER) which CONTRACTOR is required to purchase and maintain in accordance with the General Conditions. On return of the signed Agreement to CONTRACTOR, OWNER shall deliver any certificates of insurance which OWNER is required to purchase and maintain in accordance with the General Conditions.

20.03 When the successful Bidder returns the executed Agreement to OWNER for OWNER's signature, it shall be accompanied by proof that successful Bidder has an employee drug testing program in place. Such proof may include a copy of the successful Bidder's adopted policy or program for employee drug testing.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other contract Documents which are identified in the Agreement as attached thereto. Within fifteen (15) days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER. Within ten (10) days thereafter, OWNER shall deliver three fully signed counterparts to Successful Bidder with a complete set of the Drawings with appropriate identification. The date of the OWNER'S signature will become the effective date of the agreement unless another effective date is agreed to by all parties.

ARTICLE 22 - SALES AND USE TAXES AS REQUIRED

22.01 Compliance with ORS 279C.840 and payment of prevailing wage rates is a requirement of this Contract. Requirements are further defined in the General Conditions.

SECTION 00410 – BID FORM

PROJECT IDENTIFICATION:

City of Coos Bay - Pump Station No. 4:
Schedule I – Pump Station 4 Replacement
Schedule II – Force Main and Gravity Sewer

CONTRACT IDENTIFICATION AND NUMBER:

THIS BID IS SUBMITTED TO: Jennifer Wirsing, Engineering Service Coordinator
Public Works and Development
City of Coos Bay
500 Central Avenue
Coos Bay, Or. 97420

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in the Bid and in accordance with the other terms and conditions of the Bidding Documents.

2.01 Bidder accepts all of the terms and conditions of the Advertisement and Instructions to Bidders, including without limitations those dealing with the dispositions of Bid security. The Bid will remain subject to acceptance for 70 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of OWNER.

3.01 In submitting this Bid, Bidder represents, as set forth in the Agreement, that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged.

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site(s) and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all Federal, State, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) as provided in Article 3 of the General Conditions, and (2) reports and drawings of a Hazard Environmental Condition, if any, as provided in Article 3 of the General Conditions.

E. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means,

methods, techniques, sequences, and procedures of construction to be employed by the Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of the Work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

I. Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by ENGINEER is acceptable to Bidder.

J. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

K. Bidder will comply with the applicable provisions of ORS 279C.840 and with the provisions in the Supplementary General Conditions relating to the payment of prevailing wage rates.

L. _____ By initialing this space, the Bidder hereby certifies that he or she has not
(initial)
discriminated against minorities, women, or emerging small business enterprises in obtaining any required subcontracts.

M. The Bidder hereby certifies that it is a resident Bidder as defined in ORS 279A.120, of the **State of** _____.
(State name)

N. Pursuant to ORS 279C.505 (2), the Bidder hereby certifies that it has an employee drug testing program in place and if awarded a contract will provide proof of such program when executed Agreements are returned to OWNER.

4.01 Bidder further represents that this Bid is genuine and not made in the interest of or on the behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

5.01 Basic Bid – Schedule I – Pump Station No. 4 Replacement

Bidder will complete the Basic Bid Work in accordance with the Contract Documents for the following price(s):

Item	Description	Item Price
1	Mobilization, Insurance, Overhead, and Bonds	
2	Construction Facilities, Temporary Systems and Bypass Provisions	
3	Wetwell, Excavation, Shoring, Dewatering and Installation	
4	Submersible Pump, VFD, Accessories and Pump Installation	
5	Electrical, Wiring, Panels, Level Controls, Utility Conn, Etc.	
6	50 kW Generator and Automatic Transfer Switch	
7	Control Building, Gen. Cover, Gen. Pad	
8	Site Piping, Valves, Fittings and Vault	
9	Flow Meter and Vault	
10	12-Inch Influent Pipe, bedding and backfill	
11	Site Work, Site Pavement, Fence, Retaining Wall, and Site Drainage	
12	AC Pavement on new Access Ramp up to wetwell	
13	Demolition and Abandonment of Lift Station and Forcemain and Old Gravity Mains	
14	Misc. Restoration and Clean Up	

TOTAL BASIC BID $**_____ **$_____
(use figures) *(use words)*

Authorized Signature:_____ Date:_____, 20_____

Title:_____

5.02 Basic Bid - Schedule II – Force Main and Gravity Sewer

Bidder will complete the Basic Bid Work in accordance with the Contract Documents for the following price(s):

Item	Description	Est. Quantity	Unit	Unit Amount	Total
1	Mobilization, Bonding, and Insurance	1	ls		
2	Construction Facilities and Temporary Controls	1	ls		
3	Demolition & Site Prep	1	ls		
4	Foundation Stabilization	100	cy		
5	12" 3034 PVC SS Pipe - Class B	393	lf		
6	8" HDPE SS Pipe	465	lf		
7	8" HDPE wall anchor	3	ea		
8	Connection to Exist'g Manholes	3	ea		
9	New SS Manhole (Standard)	2	ea		
10	Epoxy coat discharge manhole	1	ea		
11	AC Pavement, Anderson Ave & 11th ROW	80	ton		
12	Site Cleanup and Landscape Restoration	1	ls		

TOTAL BASIC BID $**_____ **$_____
(use figures) *(use words)*

Authorized Signature:_____ Date:_____, 20_____

Title:_____

5.04 Unit Prices have been computed in accordance with Article 10 of the General Conditions.

5.05 Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities provided, determined as provided in the contract Documents.

5.06 The basis of award of the Contract will be to the lowest responsive and responsible Bidder for the project(s) and shall be awarded for each individual Schedule and/or any combination thereof provided such action is in the Owners best interest.

5.07 Identity of the successful Bidder may not specifically be determined at the time of opening of the Bids. The Owner reserves the right to evaluate all options and obtain the opinion of the council and the Engineer on the legality and sufficiency of all bids.

5.08 Any protest of award must be filed with the Owner within five (5) calendar days from the receipt by fax of the notification of Intent to Award.

6.00 **Time of Completion**

6.01 If individual schedule is awarded to Bidder, Bidder agrees that the Work under the Basic Bid for each individual Schedule will be substantially complete within **180** calendar days after the date when the Contract Time commences to run as provided in Article 1 - of the General Conditions, and completed and ready for final payment in accordance with the General Conditions.

6.02 If multiple schedules are awarded to Bidder, Bidder agrees that the Work under the Basic Bid for the awarded Schedules will be substantially complete within **180** calendar days after the date when the Contract Time commences to run as provided in Article 1 - General Conditions, and completed and ready for final payment in accordance with the General Conditions.

6.03 Bidder accepts the provisions of the Agreement as to liquidated damages, in the event of failure to complete the work within the times specified above, which shall be stated in the Agreement.

7.00 **Attachments to This Bid**

7.01 The following documents are attached to and made a condition of the Bid:

A. Required Bid security in the form of Bid Bond or as otherwise stipulated by Owner;

B. Proposed Subcontractor list (to be submitted in accordance with Article 12 of the Instructions to Bidders);

C. Bidder's Prequalification Form (Submitted prior to bid or on file with OWNER as directed in the Invitation to Bid)

D. Non Collusion Affidavit

E. City of Coos Bay Business License Application (if not currently held by Contractor)

8.01 Communications concerning this Bid shall be addressed to the BIDDER indicated below.

9.01 The terms used in this Bid which are defined in the General Conditions of the Construction Contract included as part of the Contract Documents have the meanings assigned to them in the General Conditions.

BIDDER is in compliance with the requirements of and is registered and bonded with the State of Oregon Construction Contractor's Board as follows:

- Registered Classification: _____
- Registration No: _____
- Expiration Date: _____
- Employer's Tax ID No: _____

SUBMITTED ON _____, 20 _____

10.01 Bidder to affix signatures below under the appropriate organization.

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____ SEAL, if required by State
(Individual's signature)

Doing business as: _____

Business address: _____

_____

Phone No. (___)_____ FAX No. (___)_____ E-Mail Address _____

A Partnership

Partnership Name: _____

By: _____ SEAL, if required by State
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Business address: _____

_____

Phone No. (___)_____ FAX No. (___)_____ E-Mail Address _____

A Corporation

Corporation Name: _____

State of Incorporation: _____

Type (General Business, Profession, Service, Limited Liability): _____

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Attest _____
(Signature of Corporate Secretary)

CORPORATE SEAL, if required by State

Business address: _____

_____

Phone No. (___)_____ FAX No. (___)_____ E-Mail Address _____

Date of Qualification to do business is _____

A Joint Venture

Joint Venture Name: _____

By: _____
(Signature of joint venture partner -- attach evidence of authority to sign)

SEAL, if required by State

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone No. (___)_____ FAX No. (___)_____ E-Mail Address _____

Joint Venture Name: _____

By: _____
(Signature of joint venture partner -- attach evidence of authority to sign)

SEAL, if required by State

Name (typed or printed): _____

Title: _____

Business address:

_____

_____

Phone No. (___)_____ FAX No. (___)_____ E-Mail Address _____

Phone and FAX Number, and Address for receipt of official communications:

_____

_____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is party to the venture should be in the manner indicated above.)

BID BOND

Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

BIDDER (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):

City of Coos Bay
500 Central Avenue
Coos Bay, OR 97420

BID
Bid Due Date: May 25, 2010
Project (Brief Description Including Location): **City of Coos Bay - Collection System Improvements**

BOND
Bond Number:
Date (Not later than Bid due date):
Penal sum _____ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER	SURETY
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest: _____	Attest: _____
Signature and Title	Signature and Title

Note: Above addresses are to be used for giving required notice.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Surety's liability.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2. All Bids are rejected by Owner, or

3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

PROPOSED SUBCONTRACTOR LIST

A. Subcontractor List

1. Bidder shall list below the name, address, Construction Contractor's Board (CCB) number, description of work and dollar value of the subcontract for each subcontractor performing work in excess of the amount specified ORS279C.370. If no subcontractor will be performing work on this project in excess of the amount specified ORS279C.370, Bidders shall enter "NONE" in the first line below. **Remove this form and submit it in a separate sealed envelope within two hours after Bids are due, at the time and place specified in the Invitation for Bids, Section 00100.**

Name	Address	CCB #	Description of Work	$ Value of Subcontract

2. Total value of work provided by all subcontractors including those listed above is $ _____.

Signature of Bidder	Printed Name of Bidder	Title	Company Submitting

OREGON DEPARTMENT OF TRANSPORTATION

2010 - 11 PRIME CONTRACTOR PREQUALIFICATION APPLICATION

Effective September 1, 2010 through August 31, 2011

Submit application and make check payable to:	Filing Fee $100	
	FSB Date	Initials

Oregon Department of Transportation
ODOT Procurement Office - Construction
455 Airport Road SE, Bldg K, Salem OR 97301-5348
Phone (503) 986-6916
Web Site: www.oregon.gov/ODOT/CS/CONSTRUCTION

A. Date: _____ **Valid Through:** 08-31-11

B. Application of _____
Legal Business Name (Complete Section8)

_____
Assumed Business Name(s) (Complete Section 6)

List previous business names of your organization: _____

C. Business Structure (Check one):

- ☐ Individual Sole Proprietorship
- ☐ General Partnership
- ☐ Corporation
- ☐ S-Corporation
- ☐ Limited Partnership (LP)
- ☐ Limited Liability Company (LLC)
- ☐ Limited Liability Partnership (LLP)

D. ☐ **Joint Venture**

F. Purpose of Application (Check all that apply):

- ☐ **ODOT Projects**
  1st anticipated bid opening date _____
- ☐ **Local Government Projects**
  1st anticipated bid opening date _____
- ☐ **Other Government Projects**
  1st anticipated bid opening date _____

E. Address: (Required)

Physical address, city, state, zip (for courier use)			
Mailing address, city, state, zip			
Phone		Fax	

Phone		Contact person	
	(Phone No. and person to contact regarding application)		

E-mail		Contact person	
Phone		Fax	

(Email, phone and fax of person to appear on Planholders List)

RECEIPT DATE #1	RECEIPT DATE #2	RECEIPT DATE #3	RECEIPT DATE #4

FOR OFFICE USE ONLY

APPROVAL/LAST RECPT DATE / INIT _____ ADD #1 DATE_____ _ / INIT____ DESC: _____
REVIEW DATE / INIT _____
ELIGIBILITY DATE _____ ADD #2 DATE_____ / INIT_____ DESC: _____
VENDOR NO. _____
DATA ENTRY DATE / INIT_____ CHECK SENT TO FSB: DATE_____ INIT _____

Introductory Statement:
In accordance with the statutes of the State of Oregon, every public contracting agency contemplating receiving bids for and awarding any contract for a public improvement may require any prospective bidder ***(herein referred to as applicant)*** to submit a full and complete statement concerning their equipment and experience in constructing public improvements. The Oregon Department of Transportation (ODOT) requires prequalification under OAR 734, Division 10, and is the public contracting agency in this instance utilizing this prequalification application and prequalification process. Further references to "public contracting agency" throughout this application are intended to be references to ODOT.

The application and questionnaire forms which are bound herewith comply with the requirements of public contracting rules and must be used in determining the qualifications of applicants and in assigning limits as to the size and kinds of projects for which the applicant may submit bids.

The applicant should use care, honesty and integrity in preparing this information. The public contracting agency may make independent inquiries concerning the contractor's past performance and capabilities.

Manner of Preparing and Filling in Forms:
This application shall include equipment and experience information for only the specific single business organization or entity which is applying for prequalification and which would be the signatory on a contract with the public contracting agency.

All answers and other entries on the forms, except signatures, should be typed or printed in ink. It is the responsibility of the applicant to return all pages whether applicable or not. Failure to do so may be grounds for denial of prequalification. Application and instructions are online at:
http://www.oregon.gov/ODOT/CS/CONSTRUCTION/Prequalifications.shtml

All answers and entries must be specific and complete in detail.

The prequalification application must be signed by the applicant and sworn to as the form indicates. The signatory of the statement certifies the truth and accuracy of all statements and of all answers to questions.

The original signed application must be sent to the Public Contracting Agency. Photocopy or fax signatures will not be accepted.

OAR 734-010-0240 (2) Prequalification applications must be received at ODOT's address shown in the prequalification application at least 10 calendar days before the bid opening in which the applicant wishes to participate. **OAR 734-010-0240 (4)** The date on which all required information has been received by ODOT Procurement Office - Construction will be considered the receipt date of the prequalification application.

Use of Attachments:
Schedules, reports and other forms of prequalification statement may be used as attachments to the prescribed form, provided that the information contained therein specifically includes the information required by this form.

Place of Submission:
Prequalification applications shall be submitted to the designated office of the public contracting agency.

Time of Submission:
Each Public Contracting Agency may have specific time requirements for filing applications. The applicant should check with the designated office of the applicable agency for submission time.

Appeal Due to Denial or Revocation of Prequalification:
In case the applicant's application for prequalification is denied or in case an existing prequalification is revoked, the applicant may appeal the denial or revocation in accordance with the rules adopted by the Department of Administrative Services or the appropriate local contract review board.

Notification of Action Taken:
The applicant will be notified, in writing, of the action on their application. Applicant will then be allowed to bid on such projects as are within the limits of size and kind of work for which applicant has been determined qualified.

Period During Which a Qualified Applicant Remains Qualified:
An applicant who has been notified of prequalification for projects of a given size and kind will usually remain qualified until the date specified in the notification. The public contracting agency may limit prequalification approval to individual public improvement projects. Unless such applicant is otherwise notified by the public body of prequalification in work classes, the applicant will be permitted to submit bids for all projects receiving bids of the kind and size applicant has been qualified. Prequalification for specified kinds and sizes of projects, allows the applicant to submit bids on any and all such projects, unless applicant is otherwise notified by the public contracting agency.

Requirement of Continuing Prequalification:
Applicants who have once been qualified with an agency requiring prequalification and who desire to maintain an uninterrupted prequalification standing are required to submit a new application periodically as required by such agency. Uninterrupted prequalification is contingent upon favorable action on the application. A prequalification may be revoked under the provision of ORS 279C.430.

Changes:

Major changes must be submitted with a new prequalification application with a $100 filing fee. Minor changes may be submitted by addendum to the public contracting agency. There is no charge for minor changes. Minor changes include, but are not limited to, address, company name, adding, or deleting classes of work.

Any change to an applicant's prequalification application must be received at ODOT's address shown in the prequalification application at least 10 days prior to bid opening if that information affects the bid submitted. Any changes requested by the applicant must be submitted and signed by the same person who signed the original application or by a person holding the same position as the person who signed the original application(OAR 734-010-0240 (10)).

Contact the Public Contracting Agency for specific procedures when there are changes to the information submitted in the application.

Requests for revision of the prequalification standing of any applicant will be considered whenever the applicant can make a showing of materially improved ability, but not more often than once in three months.

With or without a request from a prequalified applicant, the prequalification limitation on class of work or size of project MAY be reviewed and expanded, increased or decreased as found appropriate. The prequalified applicant will be notified in writing of any such revision.

Joint Venture:
A public contracting agency may adopt special requirements concerning joint ventures. Before submitting a joint venture application, an applicant should ascertain if special instructions are applicable and obtain them from the designated public officer.

Jurisdiction:
ORS 279C.430 (2) states: When a contracting agency permits or requires prequalification of bidders, a person who wishes to prequalify shall submit a prequalification application to the contracting agency on a standard form prescribed under subsection (1) of this section. Within 30 days after receipt of a prequalification application, the contracting agency shall investigate the applicant as necessary to determine if the applicant is qualified. The determination shall be made in less than 30 days, if practicable, if the applicant requests an early decision to allow the applicant as much time as possible to prepare a bid on a contract that has been advertised. In making its determination,. the contracting agency shall consider only the applicable standards of responsibility listed in ORS 279C.375 (3)(b). The agency shall promptly notify the applicant whether or not the applicant is qualified.

Nonresident Bidders:
ORS 279A.120 (3) states: When a public contract is awarded to a nonresident bidder and the contract price exceeds $10,000, the bidder shall promptly report to the Department of Revenue (DOR) on forms to be provided by the department the total contract price, terms of payment, length of contract and such other information as the department may require before the bidder may receive final payment on the public contract. The contracting agency shall satisfy itself that the requirement of this subsection has been complied with before the contracting agency issues a final payment on a public contract.

For information about DOR requirements contact at: http://www.oregon.gov/DOR/BUS/contact_us.shtml

NOTICE: APPLICANT MUST ANSWER ALL SECTIONS AND QUESTIONS IN THIS APPLICATION. FAILURE TO DO SO WILL RESULT IN THE APPLICATION BEING RETURNED TO THE APPLICANT FOR COMPLETION.

BUSINESS STRUCTURE: Complete section 1, 2, 3, 4, or 5 as applies

1 If an Oregon corporation, complete this section ☐ NA

When incorporated _____

President _____ Secretary _____

1st Vice President Treasurer

CONTRACT EXECUTION - List of Authorized Personnel

A) President and Secretary (**Both** President **and** the Secretary of the corporation are **required** to sign ODOT contracts and performance and payment bonds unless certified, true and correct copy of corporate bylaws or minutes state otherwise and **are attached to this prequalification**.)

Printed name of President — Signature

Printed name of Secretary — Signature

B) Are other officers besides the President and Secretary of your company authorized to execute contracts?
☐ Yes ☐ No **If yes, list below and attach certified, true and correct copy of corporate bylaws or minutes stating that authority.**

Printed name and title — Signature

Printed name and title — Signature

Printed name and title — Signature

Printed name and title — Signature

C) Are any of the officers (listed above in A) & B)) authorized to sign and execute contracts and bonds on **behalf of the company without the signature of others**? ☐ Yes ☐ No

IF YES, YOU MUST ATTACH CORPORATE BYLAWS OR MINUTES STATING THIS AUTHORITY TO SIGN ALONE ON BEHALF OF THE CORPORATION IN THE CORPORATE BYLAWS OR MINUTES.

BID EXECUTION - List of Authorized Personnel

Signatures of all individuals **(INCLUDING ANY OFFICERS LISTED ABOVE)** authorized to execute **Bids** on behalf of the company shall be listed in this section, including any officers listed above and those individuals with digital signatures used for electronic bidding.

Printed name and title — Signature

Printed name and title — Signature

Printed name and title — Signature

Printed name and title — Signature

(Additional documentation may be required by the public contracting agency)

2 If a general partnership, complete this section ☐ NA

Date of Organization _____

If a foreign (out of state) co-partnership or persons engaging in business in the state under an assumed name, but not domiciled within this state, is the partnership or business organization registered as required in compliance with Chapter 648, Oregon Revised Statutes? ☐ Yes ☐ No

Names and addresses of partners:

_____

_____

_____

If the Contractor is a partnership or limited liability partnership, an authorized representative of **each** Entity comprising it shall sign the Contract, Performance Bond, and Payment Bond, and an authorization to sign shall be attached. **If only one partner is signing, then bylaws or minutes must include the authority to sign without the signature of others.**

Printed names, titles and signatures of partners authorized to **EXECUTE CONTRACTS**

Printed name of partner	Signature
Printed name of partner	Signature

Bylaws or Minutes Submitted: (Check one) ☐ Yes ☐ No (Only submit if signatures differ from above)

Printed names, titles and **signatures** of personnel authorized to **EXECUTE BIDS**
Signatures of all individuals **(INCLUDING ANY OFFICERS LISTED ABOVE)** authorized to execute **Bids** on behalf of the company shall be listed in this section, including any officers listed above and those individuals with digital signatures used for electronic bidding.

Printed name and title	Signature
Printed name and title	Signature
Printed name and title	Signature
Printed name and title	Signature

(Additional documentation may be required by the public contracting agency)

3 If a foreign (out of state) corporation, complete this section ☐ NA

When incorporated _____

President _____ Secretary _____

1st Vice President Treasurer

CONTRACT EXECUTION - List of Authorized Personnel

A) President and Secretary (**Both** President **and** the Secretary of the corporation are **required** to sign ODOT contracts and performance and payment bonds unless certified, true and correct copy of corporate bylaws or minutes state otherwise and **are attached to this prequalification**.)

Printed name of President	Signature
Printed name of Secretary	Signature

B) Are other officers besides the President and Secretary of your company authorized to execute contracts?
☐ Yes ☐ No **If yes, list below and attach certified, true and correct copy of corporate bylaws or minutes stating that authority.**

Printed name and title	Signature
Printed name and title	Signature
Printed name and title	Signature
Printed name and title	Signature

C) Are any of the officers (listed above in A) & B)) authorized to sign and execute contracts and bonds on **behalf of the company without the signature of others**? ☐ Yes ☐ No

IF YES, YOU MUST ATTACH CORPORATE BYLAWS OR MINUTES STATING THIS AUTHORITY TO SIGN ALONE ON BEHALF OF THE CORPORATION IN THE CORPORATE BYLAWS OR MINUTES.

BID EXECUTION - List of Authorized Personnel

Signatures of all individuals **(INCLUDING ANY OFFICERS LISTED ABOVE)** authorized to execute **Bids** on behalf of the company shall be listed in this section, including any officers listed above and those individuals with digital signatures used for electronic bidding.

Printed name and title	Signature
Printed name and title	Signature
Printed name and title	Signature

Name and address of registered agent in Oregon:	Date of authorization by Oregon Secretary of State to transact business in Oregon:
	Has applicant filed with Oregon Department of Revenue (DOR) forms required by ORS 279A.120? ☐ Yes ☐ No
	Sec. of State Phone: 503-986-2200 Web site: www.filinginoregon.com Department of Revenue Phone: 503-378-4988 Web site: www.oregon.gov/DOR

(Additional documentation may be required by the public contracting agency)

4 If a limited liability company, limited liability partnership or a limited partnership indicate below ☐ NA

Check One: ☐ Limited liability company ☐ Limited liability partnership ☐ Limited partnership

Have you registered with the Oregon Secretary of State, Corporation Division, Business Registry? ☐ Yes ☐ No	Name and address of organizer:

If the Contractor is a LLC, LLP, or LP company an authorized representative of **each** Entity comprising it shall sign the Contract, Performance Bond, and Payment Bond, **AND YOU MUST SUBMIT YOUR ARTICLES OF ORGANIZATION AND OPERATING AGREEMENTS THAT INDICATES THE AUTHORIZATION TO SIGN. If any representative is authorized to execute contracts without the signature of others, this must be stated in your Articles of Organization and Operating Agreements.**

Printed names, titles and signatures of personnel authorized to **EXECUTE CONTRACTS:**

Printed name and title	Signature
Printed name and title	Signature

Are other representatives besides the ones listed above able to execute contracts? ☐ Yes ☐ No **If yes, submit names, titles and signatures separately.**

Printed names, titles and signatures of personnel authorized to **EXECUTE BIDS**
Signatures of all individuals **(INCLUDING ANY OFFICERS LISTED ABOVE)** authorized to execute **Bids** on behalf of the company shall be listed in this section, including those individuals with digital signatures used for electronic bidding.

Printed name and title	Signature
Printed name and title	Signature
Printed name and title	Signature
Printed name and title	Signature
Printed name and title	Signature

5 If doing business as a sole proprietorship, fill out the following information ☐ NA

Name of individual liable for all obligations of the business: _____

If applicant is a sole proprietor using an assumed business name, please list name below:

Registration date: Expires:

Printed name and title	Signature

(Additional documentation may be required by the public contracting agency)

6 If doing business under an assumed business name, fill out the following information ☐ NA

Assumed business name: _____

Owner's name and address: _____

Oregon Secretary of State Corporation Division's Registration Number: (www.filinginoregon.com/bizreg/index.htm) Renewal Date:

7 OWNERSHIP AND CONTROL (A, B, and C)

(a) Is there any organization, owned or controlled by the applicant, its officers, directors, partners and anyone owning at least 10 percent interest in the firm, or in which the applicant was or is an officer, director, partner, doing business in Oregon under another name?
☐ Yes ☐ No If yes, please list in space below. If no, write N/A in space below.

(b) Are there any individuals, companies or corporations owning 10 percent or more of applicant's firm?
☐ Yes ☐ No If yes, please list in space below. If no, write N/A in space below.

(c) Are there any other personnel in applicant's organization who have a financial interest in or serve as officers or partners in another firm prequalified to bid in this or another state?
☐ Yes ☐ No If yes, please list below in space provided. If no, write NA in space below.

Individual's Name	Present Position or Office	Other Firm or Firms	Position in Other Firm(s)	State of Other Firm

8 LICENSES AND REGISTRATIONS

Oregon Secretary of State Corporation Division – Active Business Registry No.
www.filinginoregon.com/bizreg/index.htm
Phone: (503) 986-2200

_____
Required for Legal Business Name, Assumed Business Name (page 1B), Corps, LLCs, LLPs, and LPs. Required prior to contract execution.

Oregon Construction Contractors Board No.
www.ccb.state.or.us
Phone: (503) 378-4621

_____
Required prior to bid opening for state-funded projects or prior to contract execution for federally-funded projects (not required for Aggregate Production or Landscaping work categories).

Oregon Business Landscape Contractors License No. and company name: _____
Individual Landscape Contractor License No. and name: _____
www.lcb.state.or.us
Phone: (503) 986-6561

Oregon Electrical Contractor License No. and company name: _____
Supervisor's License No. and Name : _____
www.oregon bcd.org
Building Codes Division phone: (503) 378-4133

Oregon Plumbing Business License No. and company name: _____
Journeyman's License No. and Name: _____

Oregon Boiler/Pressure Vessel Business License No. and company name: _____
www.oregon bcd.org
Building Codes Division phone: (503) 378-4133

Other License No. _____

9 BONDING TOTAL

Indicate the total amount of work, expressed in dollars, for which the applicant can be bonded at one time:

$ _____

10 BID, PERFORMANCE AND PAYMENT SURETY BONDS

If the contract(s) for which this prequalification is sought require bid, performance and payment bonds, the applicant shall state the name of the agent and name, address and telephone number of the surety company applicant **expects** to provide the bonds.

Agent's name: _____
Agent's address: _____
Agent's telephone #: _____
Surety name: _____
Surety address: _____
Surety telephone #: _____

11 SUPPLEMENTAL QUESTIONS

A) Have you ever been denied prequalification or had prequalification suspended or revoked by any state, local or federal agency in this or any other state?
(Check one) ☐ **Yes** ☐ **No** **If yes, please attach an explanation.**

B) Have you ever been debarred from bidding on contracts by any state, local or federal agency in this or any other state under any state or federal law?
(Check one) ☐ **Yes** ☐ **No** **If yes, please attach an explanation.**

C) Has any officer or partner of the applicant ever applied for prequalification with the public contracting agency under a different name?
(Check one) ☐ **Yes** ☐ **No** **If yes, please attach an explanation.**

D) Has the applicant ever failed to complete a state, local or federal public improvement (works) contract?
(Check one) ☐ **Yes** ☐ **No** **If yes, please attach an explanation.**

E) Has any officer or partner of the applicant ever been found in breach of a local, state or federal contract?
(Check one) ☐ **Yes** ☐ **No** **If yes, please attach an explanation.**

F) Within the last three years has the applicant, or any officer, partner, agent or employee of applicant been found to have violated any state or federal prevailing wage statute or regulation (including the federal Davis-Bacon and related Acts and ORS 279C.800 et. seq.) in any Final Order of the Oregon Bureau of Labor and Industries or the United States Department of Labor, or by any court of competent jurisdiction?
(Check one) ☐ **Yes** ☐ **No**
If yes, provide copies of the final order(s) or judgment in which this occurred and explain **in detail**:
(a) the circumstances behind any violation, including the amount(s) not paid
(b) whether the amount(s) have now been paid
(c) the reasons for the violation
(d) all efforts undertaken to ensure that future violations will not occur

G) Within the last three years has the applicant, or any officer, partner, agent or employee of applicant been found to have violated any state or federal environmental statute or regulation (including but not limited to Environmental Protection Agency, Department of Environmental Quality, US Fish and Wildlife Service, Department of Fish and Wildlife, US Army Corps of Engineers, Division of State Lands, Department of Agriculture or Department of Interior), or any permit issued by one of these agencies, in any agency Final Order or by any court of competent jurisdiction?
(Check one) ☐ **Yes** ☐ **No**
If yes, provide copies of the final order(s) or judgment in which this occurred and explain **in detail**:
(e) the circumstances behind any violation, including the amount(s) not paid
(f) whether the amount(s) have now been paid
(g) the reasons for the violation
(h) all efforts undertaken to ensure that future violations will not occur

12 EQUIPMENT, FACILITIES, AND PLANTS (A, B, C, and D)

(A) Equipment owned by the applicant: List only major items. Lump together small equipment and tools. **Attachments are acceptable if all required information is included.**

Quantity, Description and Capacity of Items	Age in Years	Condition of Equipment

(B) Total market value of equipment: $ _____
(Required)

(C) Does applicant intend to rent equipment? ☐ **Yes** ☐ **No If yes, provide a general description:**
(Required)

_____

_____

_____

***(D) Production Facility or Plant** ☐ **Yes** ☐ **No If yes, complete below:**
(Required)

Description	Location	Capacity

*** ODOT's acceptance of this prequalification does not imply ODOT's approval as material sources for ODOT projects**

13 CLASSES OF WORK

Fill in the classes of work on which you wish to bid. Classes of work include, but are not limited to, work listed in parentheses. If more space is required, attach additional sheets.

For Each Class of Work:
Check beside each Class of Work for which you have demonstrated experience in Section 14. This may be with your own work force or through project management of subcontractors.
List all other states where applicant is currently qualified or has been qualified within the last three (3) years to perform work.

(Highways, Roads, Streets)

Class of Work	States qualified within the last (3) years
☐ **(AB)** Aggregate Bases	
☐ **(ACP)** Asphalt Concrete Paving and Oiling (Paving, Chip Sealing, Crack Sealing, Slurry Sealing, Fog Sealing)	
☐ **(REIN)** Bridges and Structures (Concrete, Steel, and Timber Bridges, Retaining Walls and Soundwalls; Seismic Retrofit; Box Culverts; Structural Plate Pipe, and Pipe Arches)	
☐ **(BLD1)** Buildings (Toilets, Bathhouses, Maintenance, Sand Sheds)	
☐ **(EART)** Earthwork and Drainage (Clearing, Earthwork, Blasting, Riprap, Culverts, Manholes, Inlets, Storm Sewers, Sanitary Systems)	
☐ **(ELEC)** Electrical (Traffic Signals, Illumination, Ramp Meters, Roadway Weather Information Systems (RWIS), Variable Message Signs (VMS), Traffic Cameras)	
☐ **(LS)** Landscaping (Roadside Seeding, Lawns, Shrubs, Trees, Irrigation Systems, Topsoil, Temporary and Permanent Erosion Control)	
☐ **(MHA)** Miscellaneous Highway Appurtenances (Guardrail, Barrier, Curbs, Walks, Fences, Protective Screening, Impact Attenuators, Cold Plane Pavement Removal, Rumble Strips)	
☐ **(PAI1)** Painting (Bridges and Buildings)	
☐ **(PAVE)** Pavement Markings (Permanent - Painted, Durable, Markers, Delineators)	
☐ **(PCP)** Portland Cement Concrete Paving	
☐ **(AC)** Rock Production (Aggregate Crushing, Sanding Rock)	
☐ **(SIGN)** Signing (Permanent)	
☐ **(TTC)** Temporary Traffic Control (All Temporary Traffic Control Items Including Flaggers and Pilot Cars)	
☐ **(OTH1)** Other, (List specific class) ____ ____ ____	

14 EXPERIENCE

List no more than three (3) **major** projects that support each class of work you selected on page 13 that applicant has undertaken as a prime or sub in the last five years beginning with the most recent. Please limit the experience to the past five years. Attachments are acceptable if all required information is included.

1. **Agency or Company Name** (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

2. **Agency or Company Name** (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

3. **Agency or Company Name** (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

14 EXPERIENCE

List no more than three (3) **major** projects that support each class of work you selected on page 13 that applicant has undertaken as a prime or sub in the last five years beginning with the most recent. Please limit the experience to the past five years. Attachments are acceptable if all required information is included.

4. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

5. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

6. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

14 EXPERIENCE

List no more than three (3) **major** projects that support each class of work you selected on page 13 that applicant has undertaken as a prime or sub in the last five years beginning with the most recent. Please limit the experience to the past five years. Attachments are acceptable if all required information is included.

7. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

8. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

9. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

14 EXPERIENCE

List no more than three (3) **major** projects that support each class of work you selected on page 13 that applicant has undertaken as a prime or sub in the last five years beginning with the most recent. Please limit the experience to the past five years. Attachments are acceptable if all required information is included.

10. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

11. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

12. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime ☐ or Sub ☐**

Project Bonded: No ☐ Yes ☐ Surety Company if Project Bonded:

14 EXPERIENCE

List no more than three (3) **major** projects that support each class of work you selected on page 13 that applicant has undertaken as a prime or sub in the last five years beginning with the most recent. Please limit the experience to the past five years. Attachments are acceptable if all required information is included.

13. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime** ☐ **or Sub** ☐

Project Bonded: No ☐ Yes ☐ **Surety Company if Project Bonded:**

14. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime** ☐ **or Sub** ☐

Project Bonded: No ☐ Yes ☐ **Surety Company if Project Bonded:**

15. Agency or Company Name (Name, address and phone w/area code): _____

Name of Project and Location of Work: _____

Check the Class(es) of Work listed below that you listed on Pages 12 and 13 that pertain to this project.

AB ☐, ACP ☐, REIN ☐, BLD1 ☐, EART ☐, ELEC ☐, LS ☐, MHA ☐, PAI1 ☐, PAVE ☐, PCP ☐, AC ☐, SIGN ☐, TTC ☐, or OTH1 ☐

Contract Amount: _____ **Date of Completion (if completed)** _____ **Prime** ☐ **or Sub** ☐

Project Bonded: No ☐ Yes ☐ **Surety Company if Project Bonded:**

15 EXPERIENCE - Continued

A. How many years has applicant been in business under present name?

As a prime contractor? _____ **As a subcontractor?** _____

B. How many years' experience in construction work has applicant had? **(Required)**

As a prime contractor? _____ **As a subcontractor?** _____

16 EXPERIENCE - Continued

What is the construction experience of all owners, officers, partners and principal individuals in applicant's organization? Also, list any other individuals or organizations that control or influence bidding in any way and to any extent.

(Attach additional sheets, if needed)

Individual's Name	Present Position or Office	Years of Construction Experience	Magnitude and Type of Work

17

Following space may be used for general remarks and explanations pertaining to the foregoing prequalification statements. Explain here any claimed experience of a business organization or entity other than the applicant, including that of any business entity which was a predecessor of applicant or which has been acquired by applicant.

18 AFFIDAVIT

STATE OF _____)

ss.

County of _____)

I, _____ being first sworn, state that I am

_____ of the applicant herein and that the statements made in
(Title of individual authorized to execute bids and contracts) this application are true and I acknowledge that any false, deceptive or fraudulent statements on the application or at a hearing will result in the denial of prequalification, and may subject me to charges of false swearing or perjury; should there be any subsequent material reduction in applicant's ability to carry out any project for which applicant desires to submit a bid; applicant will give written notice of such change to the designated officer to whom this application is submitted at least ten days prior to the bid opening and that it is understood that such notice may change the eligibility of applicant to submit the bid.

_____
(Original Signature of Individual Authorized to Execute Bids and Contracts)

Subscribed and sworn to before me this _____ day of _____, **Year** _____

Notary Seal
or
Stamp

_____
Original Notary Public Signature

My commission expires _____

SECTION 00461 - NON-COLLUSION AFFIDAVIT

Contract Bid No. _____

STATE OF _____)

County of _____)

I state that I am _____ of _____
(Title) (Name of Firm)
and that I am authorized to make this Affidavit on behalf of my firm, and its owners, directors, and officers. I am the person responsible in my firm for the price(s) and the amount of this bid.

I state that:

(1) The price(s) and amount of this bid have been arrived at independently and without consultation, communication or agreement with any other contractor, bidder or potential bidder, except as disclosed on the attached appendix.

(2) That neither the price(s) nor the amount of this bid, and neither the approximate price(s) nor approximate amount of this bid, have been disclosed to any other firm or person who is a bidder or potential bidder, and they will not be disclosed before bid opening.

(3) No attempt has been made or will be made to induce any firm or person to refrain from bidding on this contract, or to submit a bid higher than this bid, or to submit any intentionally high or non-competitive bid or other form of complementary bid.

(4) The bid of my firm is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other non-competitive bid.

(5) _____, its affiliates, subsidiaries,
(Name of Firm)
officers, directors and employees are not currently under investigation by any governmental agency and have not in the last four years been convicted of or found liable for any act prohibited by State or Federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding on any public contract, except as described on the attached appendix.

I state that _____ understands
(Name of Firm)
and acknowledges that the above representations are material and important, and will be relied on by the Owner in awarding the contract(s) for which this bid is submitted. I understand and my firm understands that any misstatement in this Affidavit is and shall be treated as fraudulent concealment from the Owner of the true facts relating to the submission of bids for this Contract.

_____
(Name/Position)

Subscribed and sworn to before me this_____ day of _____, 20 _____.

_____
Notary Public for _____
My Commission Expires: _____

Notice of Award

Date: _____

Project: City of Coos Bay – Pump Station No .4	
Owner: City of Coos Bay	Owner's Contract No.:
Contract: Construction of: Schedule I – Pump Station No. 4 Replacement Schedule II – Forcemain and Gravity Sewer Construction	Engineer's Project No.: 1201-022
Bidder:	
Bidder's Address: *[send Notice of Award Certified Mail, Return Receipt Requested]*	

You are notified that your Bid dated _____ for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for _____

[Indicate total Work, alternates, or sections of Work awarded.]

The Contract Price of your Contract is _____ Dollars ($_____).

[Insert appropriate data if unit prices are used. Change language for cost-plus contracts.]

_____ copies of the proposed Contract Documents (except Drawings) accompany this Notice of Award.

_____ sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within [15] days of the date you receive this Notice of Award.

1. Deliver to the Owner [_____] fully executed counterparts of the Contract Documents.
2. Deliver with the executed Contract Documents the Contract security [Bonds] as specified in the Instructions to Bidders (Article 20), General Conditions (Paragraph 5.01), and Supplementary Conditions (Paragraph SC-5.01).
3. Other conditions precedent:

   _____

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

_____
Owner

By:_____
Authorized Signature

_____
Title

Copy to Engineer

STANDARD FORM OF AGREEMENT
BETWEEN
CITY OF COOS BAY, OREGON
AND
[GENERAL CONTRACTOR]

THIS AGREEMENT FOR CONTRACTED SERVICES (the "Contract") is made as of the _____ day of _____, 20__, by and between the **CITY OF COOS BAY,** with offices located at **500 Central Avenue, Coos Bay, Oregon 97420** (the "OWNER") and_____ a (insert State of Incorporation) _____ Corporation, with offices located at _____ _____ (the "CONTRACTOR") (Owner and Contractor hereinafter collectively referred to as the "Parties").

ARTICLE 1 -- Work: Contractor shall complete all Work as specified and/or included in ATTACHMENT 'A'. All provisions of this contract supersede any items listed on the proposal submitted by the contractor. The contractor shall perform all work in accordance with applicable specifications, i.e., latest version of APWA/ODOT, State of Oregon Building Code, City Engineering Standards and City Ordinance.

ARTICLE 2 -- Effective Date and Duration: This Contract shall become effective upon the date of the last signature. No services shall be performed prior to this Contract Execution Date. The Contractor shall at all times carry on the work diligently, without delay and punctually fulfill all requirements herein. The passage of the contract expiration date shall not extinguish, prejudice, or limit either party's right to enforce this contract with respect to any default or defect in performance that has not been cured or the breach of any Contractor warranty.

ARTICLE 3 -- Statement of Work: The Contractor will furnish all materials, supplies, labor, equipment, tools, and other services necessary for the construction and completion _____, as provided in these Contract Documents.

ARTICLE 4 -- Contract Price: The Contractor agrees to perform all of the Work described in the Contract Documents and comply with the terms therein for the total sum of **$XXXXXXX (XXXX Thousand XXXX Hundred XXX Dollars and No Cents)** unless this Contract Price is modified by an executed change order. The Owner agrees to pay the Contractor in the manner and at such times as set forth in the City of Coos Bay General Conditions, unless otherwise modified by written agreement of the parties

ARTICLE 5 -- Contract Period: The Contractor will commence the work required by this Contract within ten (10) calendar days after the date of the Contractor's receipt of the Notice to Proceed, and will complete the work within **XX** calendar days following the date of receipt of the Notice to Proceed, unless the Contract Period is extended or otherwise modified by written agreement of the parties.

ARTICLE 6 -- Liquidated Damages: In event the Contractor fails to complete the work on or before the Contract Expiration Date, for each and every day the work contemplated under this Contract remains uncompleted beyond the Contract Expiration Date, the Contractor shall pay to the Owner the sum of _____ per calendar day as liquidated damages and not as a penalty. This sum may be deducted from money due or to become due to Contractor as compensation under this Contract.

ARTICLE 7 -- Payment to Oregon Bureau of Labor and Industries Pursuant to ORS 279C.825(2): If this Contract is a public works contract subject to ORS 279C.800 to 279C.870, Owner shall pay a fee equal to one-tenth of one percent (.1%) of the Contract Price, but not less than $250 nor more than $7,500 regardless of the Contract Price, to the Oregon Bureau of Labor and Industries at the following address:

Oregon Bureau of Labor and Industries
Wage and Hour Division, Prevailing Wage Unit
800 NE Oregon St. #32
Portland, OR 97232

The fee shall be paid at the time the Owner executes this Contract. Within 30 days of issuing the final progress payment, the Owner shall recalculate and adjust fees based on the final Contract price including all change orders and other Contract price adjustments, in accordance with OAR 839-025-0210.

ARTICLE 8 -- Tax Compliance. By its signature on this Contract, Contractor hereby certifies that it is not in violation of any Oregon tax law. For the purpose of this certification, "Oregon tax laws" includes, but may not be limited to, ORS Chapter 118, 119, 314, 316, 317, 318, 320, 321, and 323 and Sections 10 to 20, Chapter 533, Oregon Laws 1981, as amended by Chapter 16, Oregon Laws 1982 (first special session); the Homeowner's and Renters Property Tax Relief Program under ORS 310.630 to 310.690; and any local tax laws administered by the Oregon Owner of Revenue under ORS 305.620.

ARTICLE 9 -- Access to Records: For not less than three (3) years after the Contract Expiration Date, the Owner, the State of Oregon, the federal government, and their duly authorized representatives shall have access to the books, documents, papers, and records of the Contractor which are directly pertinent to this Contract for the purpose of making audit, examination, excerpts, and transcripts. If for any reason, this Contract, or any part thereof, becomes the subject of or is involved in litigation, Contractor shall retain all pertinent records for not less than three years or until all litigation is resolved, whichever is longer. Full access will be provided to the Owner in preparation for and during litigation.

ARTICLE 10 -- Funds Available and Authorized: Owner reasonably believes at the time of entering into this Contract that sufficient funds are available and authorized for expenditure to finance costs of this Contract within the Owner's current appropriation or expenditure limitation.

ARTICLE 11 -- Indemnity: Contractor shall defend, save, and hold harmless the Owner, its officers, agents, and employees, from all claims, suits, or actions of whatsoever nature resulting from or arising out of the errors, omissions, negligence or willful misconduct of Contractor or his employees, subcontractors, or agents under this contract.

ARTICLE 12 -- Insurance:

12.1 -- Contractor shall procure and maintain, at its own expense, insurance coverage equal to or greater than the following for minimums:

Workers' Compensation	Statutory Limit
Applicable Federal (e.g., Longshoremen's)	Statutory Limit
Employer's Liability	$ 1,000,000

Commercial General Liability (including contractual liability. Fire property damage & Contractors Pollution coverage as applicable)

General Aggregate (per project) (provide form CG 2503 05/09 or equivalent)	$ 2,000,000
Products-Comp/OP Aggregate	$ 2,000,000
Personal and Advertising Injury	$ 1,000,000
Each Occurrence (Bodily Injury and Property Damage)	$ 1,000,000

Property Damage liability insurance will provide Explosion, Collapse, and Underground coverage's where applicable

Umbrella/Excess Insurance

General Aggregate	$ 2,000,000
Each Occurrence	$ 2,000,000

Automobile Liability (including coverage on all owned, non-owned, hired autos)	$1,000,000 per occurrence (C.S.L.)

12.1.1. -- Should the Contractors Umbrella/Excess Insurance coverage combined with CGL coverage not equal or exceed the minimum combined coverage shown coverage must be increased to equal or exceed the minimum total coverage limits shown. If the Contractor does not have Umbrella/Excess Insurance coverage, the Commercial General Liability and Automobile Liability limits must be increased to equal or exceed the minimum total coverage limits shown.

12.1.2. -- Contractor shall provide Owner with a certificate(s) and endorsement(s) indicating that the Commercial General Liability insurance coverage is in effect which shall be primary and non-contributory with any insurance maintained by the Owner. Such certificate(s) and endorsement(s) shall name Owner as an additional insured under Contractor's commercial general liability, automobile liability, and umbrella liability policies. Copies of such endorsements or coverage enhancements shall be attached to the certificate. A waiver of subrogation under the workers' compensation and commercial general liability policies shall be provided. Thirty (30) days written notice shall be provided to the certificate holder prior to cancellation or significant modification of coverage. The Contractor shall provide Certificate of Insurance(s) & Endorsement(s), which will be a part of this Contract.

12.1.3. -- Insurance Coverage provided by the Contractor must be underwritten by an insurance company deemed acceptable by the City of Coos Bay. The City of Coos Bay reserves the right to reject all or any insurance carrier(s) with an unacceptable financial rating.

ARTICLE 13 -- Successors & Assignments: After the original Contract is executed, the Contractor shall not enter into any new subcontractor agreements for any of the work required under this Contract or assign or transfer any of its interest in this Contract, without the prior written consent of the Owner. The provisions of this Contract shall be binding upon and shall inure to the benefit of the parties hereto, and their respective successors and assigns.

ARTICLE 14 -- Compliance with Applicable Law: Contactor certifies that it will comply with all federal, state and local laws, ordinances and regulations applicable to this Contract, including, but not limited to all applicable requirements of federal and state civil rights and rehabilitation statues, rules and regulations, as well as all local ordinances and regulations pertaining to public contacting. Without in any manner limiting the foregoing, Contractor agrees that the provisions of ORS 279B.220, 279B.225, 279B.230, 279B.235 and 279B.270, ORS 279C.505, 279C.515, 279C.520 and 279C.530, shall apply to the Contract, to the extent that such statutes are not inconsistent with local ordinances and regulations pertaining to public contracting. Further, that ORS Chapter 656, ORS 979.350 and/or USC Section § 276A, apply to Contractor's performance under this Contract."

ARTICLE 15 -- Prevailing Wage: The Contractor certifies, and it shall be a condition of the Contractor's bond as provided by ORS 279C.800-279C.870, that in performing this Contract the Contractor will pay and cause to be paid not less than the prevailing wages as of the date of the bid, per hour, per day, and per week, for each and every person who may be employed in the performance of this Contract.

ARTICLE 16 -- Severability: The parties agree that if any term or provision of the contract is declared by a court of competent jurisdiction to be illegal or in conflict with any law, the validity of the remaining terms and provisions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the contract did not contain the particular term or provision held to be invalid.

ARTICLE 17 -- Waiver: The terms of this Contract shall not be waived, altered, modified, supplemented, or amended, in any manner whatsoever, except by written instrument. Such waiver, alteration, modification, supplementation, or amendment, if made, shall be effective only in the specific instance and for the specific purpose given, and shall be valid and binding only if it is signed by all parties to this Contract. The failure of the Owner to enforce any provision of this contract shall not constitute a waiver by the Owner of that or any other provision.

ARTICLE 18 -- Governing Law and Venue: This Contract shall be governed by and construed in accordance with the laws of the State of Oregon. Any litigation between the Owner and the Contractor arising out of or related to this Contract shall be brought and maintained solely and exclusively in the Circuit Court of Coos County, Oregon. Provided, if any litigation arising under this Contract must be brought in a federal forum, it shall be brought and maintained solely and exclusively in the United States District Court for the District of Oregon in Eugene, Oregon. Contractor hereby consents to the personal jurisdiction of all courts within the State of Oregon. Should any litigation be brought to enforce the terms of this Contract, the prevailing party shall be entitled to reasonable attorney fees, costs and disbursements at trial and upon appeal. Should any dispute over the terms and conditions of

this contract result in mediation or arbitration, any attorney's fees and costs incurred in such mediation or arbitration shall be paid by the party incurring such fees and costs.

ARTICLE 19 -- Merger. This Contract, which includes all Contract Documents as defined herein, constitutes the entire agreement between the parties. There are no understandings, agreements, or representations, oral or written, regarding this Contract, except as specified or referenced herein. Contractor, by the signature below of its authorized representative, hereby acknowledges that it has read this contract, understands it and agrees to be bound by its terms and conditions.

ARTICLE 20 -- Warranty. All labor and material will be warranted for one (1) year after final acceptance by the City Engineer.

ARTICLE 21 -- Execution in Counterparts. This Contract may be executed in counterparts, each of which shall be an original, and all of which shall constitute but one and the same instrument.

IN WITNESS WHEREOF, this Contract is executed:

Approved by Contractor:

_____ _____
Date

STATE OF OREGON,)
) ss.
County of Coos)

On this __ day of _____, 20__, before me appeared _____,
_____whom I know personally;
_____whose identity I proved on the basis of _____;
_____whose identity I proved on the oath/affirmation of _____, a credible witness to be the signed signer of the above document; and he/she acknowledged that he/she executed the same.

_____
NOTARY PUBLIC FOR OREGON
My Commission Expires:

Approved by Owner:

_____ _____
Date

Rodger Craddock
Print Name

City Manager, City of Coos Bay

ATTACHMENT "A"

_____, an (insert State of Incorporation) _____ Corporation (hereinafter **"Contractor"**) agrees to provide the following Professional Services (hereinafter "Basic Services") for **CITY OF COOS BAY** (hereinafter **"Owner"**), in accordance with the terms and conditions of the Contract, dated _____, 20___, all of which terms and conditions are incorporated herein by reference:

Part 'A' -- Original Request for Services:

Part 'B' – Contractor Proposal, Bid and Bid Bond:

Part 'C' -- Scope of Services:

Part 'D' -- Project Schedule:

(After award the Contractor shall provide a Project Schedule, which will be a part of this Contract)

Part 'E' -- List of Sub contractors:

(The Contractor shall provide List of Sub contractors as instructed in the advertisement and Invitation to Bid, which will be a part of this Contract)

Part 'F' – Performance & Payment Bond:

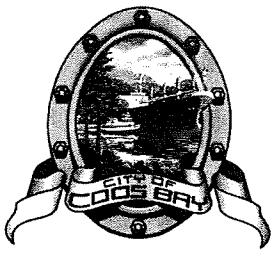
(The Contractor shall provide Performance & Payment Bond, which will be a part of this Contract)

Part 'G' – Certificate of Insurance(s) & Endorsement(s):

(The Contractor shall provide Certificate of Insurance(s) & Endorsement(s), which will be a part of this Contract)

Part 'H' -- Technical Specifications:

(The Contractor shall utilize these specifications in addition to the Draft City Engineering Standards and Construction Specifications)



Date:

Change Order Number:

Project Name:

Project No.:

_____, a _____ (Corporation/LLC/Partnership/Sole Proprietor) (hereinafter "Contractor") agrees to perform and complete the following work (hereinafter "Work") for **CITY OF COOS BAY** (hereinafter **"Owner"**), in accordance with the terms and conditions of the Contract, dated _ ___, 20__, all of which terms and conditions are incorporated herein by reference:

Part 'A-X' Scope of Additional Services:

Part 'B-X' Project Schedule (Revised):

Part 'C-X' Modification of Construction Bid (increase/decrease):

Original Contract Amount:	_____
Net amount of previous Change Order No. _____:	_____
Total Original Contract Amount net of Change Orders:	_____
Total Amount of Change Order No. ___:	_____
Total Contract Amount net of Change Order No. ___:	_____
Contract Time will be increase/decreased by:	_____
Date of completion as a result of this Change Order No.___is:	_____

"CONTRACTOR"

_____

BY:_____

Typed Name:_____

Title: _____

"OWNER"

CITYOF COOS BAY, OREGON

BY:_____

Typed Name:_____

Title:_____

PART 'A'
ORIGINAL REQUEST FOR SERVICES

PART 'B'
CONTRACTOR PROPOSAL, BID & BID BOND

PART 'C'
SCOPE OF SERVICES

PART 'D'
PROJECT SCHEDULE

(The Contractor shall attach a Project Schedule to Part 'D', which will become a part of this Contract)

PART 'E'
LIST OF SUB CONTRACTORS

(The Contractor shall attach a List of Subcontractors to Part 'E', which will become a part of this Contract)

PART 'F'
Performance & Payment Bonds

(The Contractor shall attach the Performance & Payment Bond to Part 'F', which will become a part of this Contract)

PART 'G'
CERTIFICATE OF INSURANCE(S) & ENDORSEMENT(S)

(The Contractor shall attach all Certificate of Insurance(s) & Endorsement(s) to Part 'G', which will become a part of this Contract)

PART 'H'

TECHNICAL SPECIFICATIONS

(The Contractor shall utilize these specifications in addition to the City of Coos Bay Draft Engineering Standards and Construction Specifications)

Notice to Proceed

Dated xxx xx, 2011

Project: Coos Bay Pump Station No. 4	Owner: City of Coos Bay	Owner's Contract No.:
Contract: City of Coos Bay– Pump Station No. 4		Engineer's Project No.: 1201-022

Contractor:

Contractor's Address:

You are notified that the Contract Times under the above contract will commence to run on xxx xx, 2011. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 5 of the Agreement, the number of days to achieve readiness for final payment is 120.

Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insured's) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

	City of Coos Bay
(Contractor)	(Owner)
Received by:	Given by:
	(Authorized Signature)
(Title)	(Title)
(Date)	(Date)

Copy to Engineer

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):
City of Coos Bay
500 Central Avenue
Coos Bay, OR 97420

CONTRACT
Date:
Amount:
Description (Name and Location): **City of Coos Bay – Pump Station No .4**

BOND
Bond Number:
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____
Signature and Title

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title:

EJCDC No. C-610 (2002 Edition)
Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

2. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 3.1.

3. If there is no Owner Default, Surety's obligation under this Bond shall arise after:

3.1. Owner has notified Contractor and Surety, at the addresses described in Paragraph 10 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and

3.2. Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 3.1; and

3.3. Owner has agreed to pay the Balance of the Contract Price to:

1. Surety in accordance with the terms of the Contract;

2. Another contractor selected pursuant to Paragraph 4.3 to perform the Contract.

4. When Owner has satisfied the conditions of Paragraph 3, Surety shall promptly and at Surety's expense take one of the following actions:

4.1. Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or

4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and Contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or

4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or

2. Deny liability in whole or in part and notify Owner citing reasons therefor.

5. If Surety does not proceed as provided in Paragraph 4 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 4.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

6. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To a limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

6.1. The responsibilities of Contractor for correction of defective Work and completion of the Contract;

6.2. Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions or failure to act of Surety under Paragraph 4; and

6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

7. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

8. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

11. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions.

12.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.

12.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

12.3. Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

12.4. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY – Name, Address and Telephone
Surety Agency or Broker
Owner's Respresentative (engineer or other party)

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):
City of Coos Bay
500 Central Avenue
Coos Bay, OR 97420

CONTRACT
Date:
Amount:
Description (Name and Location): **City of Coos Bay – Pump Station No. 4**

BOND
Bond Number:
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____
Signature and Title

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title:

EJCDC No. C-615 (2002 Edition)
Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, the American Institute of Architects, the American Subcontractors Association, and the Associated Specialty Contractors.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to Owner, this obligation shall be null and void if Contractor:

2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and

2.2. Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.

3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.

4. Surety shall have no obligation to Claimants under this Bond until:

4.1. Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the addresses described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2. Claimants who do not have a direct contract with Contractor:

1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and

2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and

3. Not having been paid within the above 30 days, have sent a written notice to Surety and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.

5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.

6. When a Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at Surety's expense take the following actions:

6.1. Send an answer to that Claimant, with a copy to Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2. Pay or arrange for payment of any undisputed amounts.

7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.

8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.

9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS

15.1. Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

15.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

15.3. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY – Name, Address and Telephone
Surety Agency or Broker:
Owner's Representative (engineer or other party):

Contractor's Application for Payment No. 1

	Application Period:	Application Date:
To (Owner):	From (Contractor):	Via (Engineer):
Project:	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. **ORIGINAL CONTRACT PRICE**	$
2. **Net change by Change Orders**	$
3. **Current Contract Price (Line 1 ± 2)**	$
4. **TOTAL COMPLETED AND STORED TO DATE (Column F on Progress Estimate)**	$
5. **RETAINAGE:**	
a. X _____ **Work Completed**	$
b. X _____ **Stored Material**	$
c. **Total Retainage (Line 5a + Line 5b)**	$
6. **AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5c)**	$
7. **LESS PREVIOUS PAYMENTS (Line 6 from prior Application)**	$
8. **AMOUNT DUE THIS APPLICATION**	$
9. **BALANCE TO FINISH, PLUS RETAINAGE (Column G on Progress Estimate + Line 5 above)**	$

Contractor's Certification

The undersigned Contractor certifies that to the best of its knowledge: (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

By:	Date:

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ _____
(Engineer) (Date)

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ _____
(Owner) (Date)

Approved by: _____ _____
Funding Agency (if applicable) (Date)

Endorsed by the Construction Specifications Institute.

EJCDC C-620 Contractor's Application for Payment

Progress Estimate

Contractor's Application

For (contract):	Application Number:
Application Period:	Application Date:

A		B	Work Completed		E	F		G
Item			C	D				
Specification Section No.	Description	Scheduled Value	From Previous Application (C+D)	This Period	Materials Presently Stored (not in C or D)	Total Completed and Stored to Date (C + D + E)	% (F) B	Balance to Finish (B - F)
	Totals							

Progress Estimate

Contractor's Application

For (contract):							Application Number:			
Application Period:							Application Date:			
A				B	C	D	E	F		
Item		Bid Quantity	Unit Price	Bid Value	Estimated Quantity Installed	Value	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F) B	Balance to Finish (B - F)
Bid Item No.	Description									
	Totals									

Stored Material Summary

Contractor's Application

For (contract):	Application Number:
Application Period:	Application Date:

A	B	C	D		E		F		G
			Stored Previously		Stored this Month		Incorporated in Work		
Invoice No.	Shop Drawing Transmittal No.	Materials Description	Date (Month/Year)	Amount ($)	Amount ($)	Subtotal	Date (Month/Year)	Amount ($)	Materials Remaining in Storage ($) (D + E - F)
		Totals							

Engineers Joint Documents Committee
Design and Construction Related Documents
Instructions and License Agreement

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3. If you modify the document, you must follow the instructions in the License Agreement about notification.

4. Also note the instruction in the License Agreement about the EJCDC copyright.

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The license is effective until terminated. You may terminate it at any time by destroying **EJCDC Design and Construction Related Documents** altogether with all copies, modifications and merged portions in any form. It will also terminate upon conditions set forth elsewhere in this Agreement or if you fail to comply with any term or condition of this Agreement. You agree upon such termination to destroy **EJCDC Design and Construction Related Documents** along with all copies, modifications and merged portions in any form.

Limited Warranty:
EJCDC warrants the CDs and diskettes on which **EJCDC Design and Construction Related Documents** is furnished to be free from defects in materials and workmanship under normal use for a period of ninety (90) days from the date of delivery to you as evidenced by a copy of your receipt.

There is no other warranty of any kind, either expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

EJCDC does not warrant that the functions contained in **EJCDC Design and Construction Related Documents** will meet your requirements or that the operation of **EJCDC Design and Construction Related Documents** will be uninterrupted or error free.

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1. the replacement of any document not meeting EJCDC's "Limited Warranty" which is returned to EJCDC's selling agent with a copy of your receipt, or

2. if EJCDC's selling agent is unable to deliver a replacement CD or diskette which is free of defects in materials and workmanship, you may terminate this Agreement by returning EJCDC Document and your money will be refunded.

In no event will EJCDC be liable to you for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use or inability to use **EJCDC Design and Construction Related Documents** even if EJCDC has been advised of the possibility of such damages, or for any claim by any other party.

Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

General:
You may not sublicense, assign, or transfer this license except as expressly provided in this Agreement. Any attempt otherwise to sublicense, assign, or transfer any of the rights, duties, or obligations hereunder is void.

This Agreement shall be governed by the laws of the State of Virginia. Should you have any questions concerning this Agreement, you may contact EJCDC by writing to:

Arthur Schwartz, Esq.
General Counsel
National Society of Professional Engineers
1420 King Street
Alexandria, VA 22314

Phone: (703) 684-2845
Fax: (703) 836-4875
e-mail: aschwartz@nspe.org

You acknowledge that you have read this agreement, understand it and agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between us which supersedes any proposal or prior agreement, oral or written, and any other communications between us relating to the subject matter of this agreement.

Certificate of Substantial Completion

Project: Coos Bay Pump Station No. 4	
Owner: City of Coos Bay	Owner's Contract No.:
Contract: Schedule I and Schedule II	Engineer's Project No.: 1201-22

This [tentative] [definitive] Certificate of Substantial Completion applies to:

☐ All Work under the Contract Documents: ☐ The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [definitive] list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and 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.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

☐ Amended Responsibilities ☐ Not Amended

Owner's Amended Responsibilities:

Contractor's Amended Responsibilities:

The following documents are attached to and made part of this Certificate:

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Executed by Engineer	Date
Accepted by Contractor	Date
Accepted by Owner	Date

CITY OF Coos Bay
Pump Station No. 4
{Date}

Addendum No. 1

Modification to Contract Documents

This Addendum forms a part of the Bid Documents by amending and supplementing the original documents and drawings. The Addendum shall be signed and included with the Bid as a Pre-qualification of the Bid. Necessary changes, additions, subtractions, or clarifications are described below.

REFERENCE	REQUIRED CHANGE
Bid Documents:	
Technical Specifications:	
Plans:	

Clarification:

This addendum must be acknowledged and included with the Bid Proposal.

Acknowledged By:

_____
Signature of Bidder

_____
Title

_____
Name of Firm

_____
Date

City of Coos Bay

Coos County, Oregon

CONTRACT DOCUMENTS

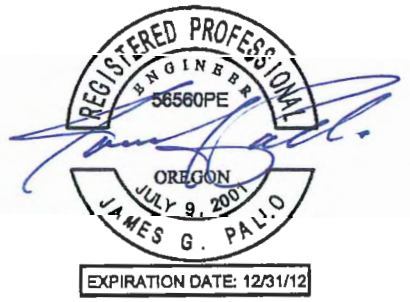
FOR THE CONSTRUCTION OF:

PUMP STATION 4

SCHEDULE I: Pump Station No. 4 Replacement

SCHEDULE II: New Gravity Sewer Line and Force Main

August, 2011
City Project No. 09/10-002
Engineers Project No.1201-022



Civil West
Engineering Services, Inc.

DIVISION 1- GENERAL REQUIREMENTS
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SECTION 01010 – SUMMARY OF THE WORK

1.01 WORK SUMMARY

A. The Contractor shall furnish all labor, equipment, and materials necessary to complete all work in accordance with the Contract Documents.

B. The work shall be performed within the City of Coos Bay, Coos County, Oregon. Coos Bay is located on U.S. Hwy 101 approximately 5 miles north of the junction with Oregon Hwy 42.

C. The Project Scope for each schedule is briefly described below:

1. Schedule I – Pump Station No. 4 Replacement shall take place within the easement south of Anderson Avenue and north of Blossom Gulch Creek. Demolition of existing station shall take place on 10th Street, adjacent to Blossom Gulch Elementary School.

    a. Obtain permits as required. Coordinate with public and private agencies including NW Natural Gas, Pacific Power, Coos Bay/North Bend Water Board, Frontier Communications and the City of Coos Bay.
    b. Construct new precast concrete wetwell, valve vault and flow meter vault as shown on the Plans. Wetwell will be 7-foot inside diameter and approximately 23 feet deep.
    c. Furnish and Install 6-inch and 8-inch ductile iron pipe, valves, fittings, and flow meter as shown on Plans.
    d. Furnish and Install new manholes and pipe to convey sewage to new wetwell.
    e. Furnish and Install two submersible centrifugal pumps, guide rails, VFDs, controls and appurtenances.
    f. Construct new CMU electrical and control building and concrete flatwork as shown on the Plans.
    g. Install natural gas-fired stationary generator, automatic transfer switch, natural gas supply pipe and connections as required.
    h. Perform site work including raising the site grade above floodplain and a new retaining wall as shown on the Plans. New asphaltic cement pavement and crushed rock surfaces. Furnish and Install chain link and cedar board perimeter fence.
    i. Connection to new 8-inch HDPE forcemain.
    j. Demolition of existing wetwell, control building, forcemain and gravity influent pipe.
    k. Electrical installation including in ground conduit, power and control wire, panels, power supply and other as required for a complete and operational installation.
    l. Temporary pumping facilities as required to maintain operation of existing pump station during construction.

2. Schedule II – New gravity sewer line and force main construction shall take place along a portion an easement between 10th Street and vacated 11th Street. Force main will continue north under 11th Street easement, across Anderson Avenue and terminate at the existing manhole at the intersection of 11th Street and an alley.

    a. Obtain permits as required. Coordinate with public and private agencies as required.

b. Furnish and install approximately 335 lineal feet of 12-inch 3034 PVC sanitary sewer piping and 58 lineal feet of 12-inch 30304 PVC storm sewer piping . Complete installation shall include, but is not limited to: trench excavation, connection to existing systems and complete testing of facilities.

c. Furnish and install approximately 465 feet of 8-inch HDPE pressure piping. Complete installation shall include, but is not limited to: trench excavation, connection to existing systems and complete testing of facilities.

d. Restoration of ac pavement and landscape under easements, 11th Street and Anderson Avenue.

e. Temporary pumping facilities as required to maintain sewer service during construction.

D. Coordination as required between Schedule I and II.

E. Work shall not begin until Engineer has issued the *Notice to Proceed* to the Contractor.

1.02 WORK PROGRESS

A. It is the intent of these Contract Documents that the Work proceed in a systematic manner so that a minimum of inconvenience to the public results in the progression of the work. Suitable equipment will be required to properly execute the work with the least amount of disruption to services and access through the work area. Contractor shall contain operations to within the designated public properties, rights-of-way and within any construction easements obtained for this project.

B. Order and schedule delivery of materials in ample time to avoid delays in construction. If any item is found to be unavailable, notify the Engineer immediately to permit the Engineer's selection of suitable substitute. Timely delivery of all materials and equipment is Contractor's responsibility. No extensions in Contract Time will be allowed due to delays caused by late delivery of items. Availability of items should be determined during bidding.

C. The Contractor shall protect the work and materials from damage due to the nature of the work, the elements, carelessness of others, or from any other cause until the completion and final acceptance of the work. All loss or damage arising out of the nature of the work to be done under these Contract Documents, or from any unseen obstruction or defects which may be encountered in the execution of the work, or from the action of the elements, shall be sustained by the Contractor.

D. The Contractor shall remove completely all materials designated for removal, to the extent specified and/or indicated in the drawings. For such materials, removal, hauling, disposal (including providing disposal location), and applicable precautions are entirely the Contractor's responsibility. Allow no excess accumulation of non-reusable material at job site(s).

E. Contractor is responsible for the protection of all existing improvements that are to remain in place. This includes, but is not necessarily limited to: existing utilities, roads, driveways, drainage ditches, culverts, fencing, shrubbery, and all landscaping structures and vegetation. Temporary enclosures, walls, covers, or other protection shall be provided and maintained by the Contractor as required. Contractor shall cooperate with the owners of such improvements, and shall restore and/or replace all damaged items as directed, without any additional expense to the Owner or payments to the Contractor.

1. The location and depth shown on the drawings for the existing underground facilities are approximate only and are not guaranteed to be accurate or complete. As-builts are not available for existing improvements.

2. Existing water meters, clean outs and other utility locations are not specifically indicated on the plans but do exist throughout the project, the contractor shall field locate all utilities prior to the start of construction. Pothole all utility crossings prior to construction as necessary to avoid conflicts. Contractor shall keep existing utilities in service and protect them during construction. Contractor is responsible for any damage to existing utilities. Portions of utilities which are to be abandoned in place may be removed be the contractor to the extent necessary to accomplish the construction.

END OF SECTION

SECTION 01025 – MEASUREMENT AND PAYMENT

1.01 GENERAL

A. Wherever in these Specifications an article, device or piece of equipment is referred to in the singular, such reference shall include as many such items as are shown on the Drawings or are required to complete the installation.

B. Miscellaneous items required in the project that do not have a corresponding Section in the Bid Form are to be considered incidental costs to the project. Compensation for such items and/or work shall be incorporated into other related bid items or total costs. No separate measurement and payment will occur for such incidental costs.

C. Monthly progress payments and final payment will be made in accordance with the Contract, the General Conditions, and the Supplementary General Conditions. A portion of all progress payments will be withheld as "retainage" in accordance with the General and Supplementary General Conditions.

D. Additional detail on measurement and payment may be found in other Sections detailing specific items.

1.02 UNIT PRICES

A. Payment will be made on a unit price basis according to the prices provided by the Contractor in the accepted Bid Form (Proposal). Payment will be made for the actual quantity of individual items (units) incorporated and installed in the project.

1.03 LUMP SUMS

A. Payments on lump sum contracts and/or bid items will be made based on the percentage of work complete at the end of the particular payment period.

B. Percentage of work complete will be recorded and submitted by the Contractor and estimated by the Engineer based on inspection. Payment will be based on the Contractor's approved schedule of values.

1.04 PROGRESS PAYMENTS

A. Monthly progress payments will be made as set forth in the Agreement, in accordance with the General Conditions and Supplementary General Conditions.

B. At the stated day of the month, submit a monthly payment request in accordance with the General Conditions and Supplementary General Conditions. Base request on actual quantities installed and completed, and/or approved schedule of values with percent complete of each item. Show payment requested for each item, and total payment requested.

C. Engineer will review payment requests and compare with inspection records to verify quantities and completed items. Engineer will recommend payment amounts for Owner approval and payment.

END OF SECTION

SECTION 01028 – CHANGE ORDER PROCEDURE

1.01 SUMMARY

A. Make such changes in the Work, in the Contract Sum, in the Contract Time of Completion, or any combination thereof, as described by Change Orders signed by the Owner, Engineer, and the Contractor.

B. See also applicable sections of the General Conditions and applicable portions of the Supplementary General Conditions.

C. Work outside the scope of the original Contract Document intent will not be paid for by Owner or Engineer unless an approved Change Order precedes such work.

1.02 PROCESSING CHANGE ORDERS

A. Change Orders will be numbered in sequence and dated. The Change Order will describe the changes and will be signed by the Owner, Engineer and the Contractor. Request for estimates for possible changes are not to be considered Change Orders or direction to proceed with the proposed changes.

B. Change Orders will be prepared by the Engineer.

C. Contractor may request that the Owner consider a Change Order by sending a written Change Order Request to both Owner and Engineer to initiate the Change Order process. Any increase in cost or time requested by Contractor shall be reasonable and based on the provisions in the Contract Documents.

D. When requested, Contractor shall provide written evidence substantiating cost changes including receipts, cost proposals from suppliers, and wage forms showing labor used for a particular change.

E. Change Orders will be processed using the form shown in these Contract Documents.

F. Change Order may include changes for costs, time, material selections, or other changes to the Contract Documents as necessary.

END OF SECTION

SECTION 01040 – COORDINATION

1.01 SUMMARY

A. Restrict work to within public rights-of-way and easements obtained for this project.

B. The Contractor shall coordinate his work with the following:

1. City of Coos Bay
2. Pacific Power
4. NW Natural
5. Frontier & Charter Communications or other affected communications
6. City of Coos Bay Public Works Department
7. Coos Bay/North Bend Water Board
8. Private Property Owners and general public
9. Other affected utilities and agencies

C. Permit and maintain access for the Owner and/or residents to any adjacent facilities that are not part of work included within the project.

D. Coordinate with Owner to determine the locations of underground piping, vaults, valves and other items that could be damaged during construction. Call the statewide utility locating service at: 1-800-332-2344 with your schedule at least two days prior to beginning work.

E. Restoration and cleanup work shall be completed with each phase of the construction project. Parking lots and properties shall be maintained and kept clean and clear of excess excavation, debris, dirt and other materials.

END OF SECTION

SECTION 01046 – PROTECTION OF EXISTING IMPROVEMENTS

1.01 GENERAL

A. Where Contractor's operations are near utility systems, structures, or are adjacent to other property, no work shall be started until Contractor has made all arrangements necessary for protection thereof have been made. Contractor shall exercise all possible precautions to prevent damage to existing structures, improvements, and underground utilities which are to remain.

B. Approximate locations of known underground utilities are shown on the Plans. Exact location or extent of such utilities is not guaranteed, and utilities may exist which are not shown on the Plans. Contractor shall call for utility locates prior to any digging. Contractor shall also pothole as required ahead of the work to verify the location and depths of affected utilities. No additional compensation will be given for such work or for utilities being different than shown on the plans.

1. All trench excavations and structure excavations within two (2) feet of any existing underground utility shall be performed by hand methods in accordance with state laws.

2. Call 1-800-332-2344 for statewide locating services prior to excavations.

a. ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through 952-0010090. You may obtain copies of the rules by calling the center. (note the telephone number for the Oregon Utility Notification Center is (503) 232-1987).

C. The Contractor shall be solely and directly responsible to the owner's and operator's of such properties and services for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage which may result from the carrying out of the work to be done under this Contract.

D. Restoration of Existing Improvements. Except as shown on the Plans or as provided elsewhere in these specifications, the Contractor shall, at their own expense, repair and/or replace all utilities, services, landscaping, structures, substructures and other improvements damaged by the operations associated with this project, as directed. These repairs and replacements shall all be suitable and proper for intended use and in every respect acceptable to the Owner, Engineer and appropriate governing body or owner of such improvement. At minimum, restoration will be required to match the existing adjacent structure/improvement in thickness, finish, quality, quantity, and aesthetics.

E. In the event of interruption of domestic water, electric, telephone, sewer, or other utility services, the Contractor shall promptly notify the proper authority and the Owner. The Contractor shall cooperate with the proper authority in restoration of service as promptly as possible and shall bear all costs of repair. In no case shall interruption of any water, sewer, or utility service be allowed to exist outside working hours unless prior approval is received from said authority and Owner.

F. The Contractor shall pothole existing waterlines or other utilities ahead of his work so that potential conflicts can be minimized or that minor relocation of the new waterline routes can be made. Potholing is defined as exploratory excavation of existing waterlines or other utilities to verify their depth and location.

1.02 INTERFERING STRUCTURES, IMPROVEMENTS AND LANDSCAPING

A. It shall be entirely the responsibility of the Contractor to locate and protect all existing structures, landscaping, and other improvements in advance of the work. Neither the Owner, Engineer, nor any of their officers or agents shall be responsible to the Contractor for damages as a result of any structures or improvements being located differently than indicated in the drawings, nor which exist and are not indicated on the drawings.

B. If interfering power poles, telephone poles, guy wires, or anchors are encountered, the Contractor shall notify the affected utility and the Engineer at least seven (7) days in advance of construction to permit arrangements for protection or relocation of the structure. However, failure of utility to respond shall create no obligation on Owner, and Contractor shall protect all utilities against damage, or shall stand all costs involved thereof.

C. Landscaping, Tree and Plant Protection. Provide adequate protection of existing landscaping against damage from construction operations, including all structures and vegetation. Protect roots, trunk and foliage of existing and new shrubs and trees from all damage including that possible from compaction and dust. Contractor shall be entirely responsible to remove and replace all property which is damaged by work related to the project. Contractor shall bear all costs associated with replacement of existing landscaping, and shall cooperate with the owner of such improvements, the Owner, and the Engineer in all protection and restoration/replacement that is required. In specific circumstances, Contractor may make special arrangements with property owners for removal of landscaping without replacement. Copies of written agreements for all such arrangements shall be furnished to the Engineer.

D. When construction operations will affect the property of a private citizen (such as driveways, landscaping, etc.), even when such improvements are in the road right-of-way, the Contractor shall notify the owner of such property and the Owner, at least seven (7) days in advance of any affecting Work, so that any desired preparations can be made.

1.03 ROADS AND ACCESS

A. All work shall be conducted to minimize damage to existing roadways, easements and parking lots, including limiting wheel loads to acceptable levels. At all times keep roadways, shoulders, and ditches free from excess materials and debris.

B. Spillage of soil, dust, rock, mud, etc. on all roads (including State, County, City and private roads) used by the Contractor (and any working for Contractor) during construction, shall be prevented as much as possible. If spillage cannot be prevented, an hourly patrol shall be provided by the Contractor to police and sweep clean all spillage. At the conclusion of each workday, such traveled areas shall be left completely clean and free from all extraneous materials. Contractor is entirely responsible to prevent such spills and follow all related laws and regulations. If spillage of hazardous material occurs, Contractor shall immediately notify the proper authorities and remove the spill in the proper manner. Owner will not be liable for any additional costs due to spillage of any kind.

C. All damaged gravel, concrete and/or asphaltic concrete surfaces shall be repaired as required to conditions acceptable to the governing body and Engineer. No cleated or

crawl-type equipment shall be operated on paved surfaces, except to cross a road when adequate protection of the surface is provided.

D. During construction the Contractor shall take necessary measures to avoid and abate excessive dust. Sprinkling of roadways and sites may be necessary and shall be conducted carefully to avoid over wetting while keeping dust to a minimum.

E. Contractor is responsible for constructing, maintaining, and removing any additional access that Contractor deems necessary for the Work. Contractor must notify Owner and Engineer, and must obtain written consent from the governing body, prior to construction of additional access not shown on the drawings. All applicable regulations shall be followed in such access construction, including obtaining any required permits.

END OF SECTION

SECTION 01050 – FIELD ENGINEERING

1.01 SUMMARY

A. Construction stakeout – No specific construction stakeout is expected for this project. Contractor shall be responsible for all project layout based upon the information provided on the Plans and measurements made at the site.

B. Contractor shall maintain proper equipment on site as necessary to ensure horizontal and vertical control and proper location of improvements.

C. The Contractor will be solely responsible for laying out the work from the information provided and no additional stakeout will be provided except at the expense of the Contractor.

END OF SECTION

SECTION 01060 – REGULATORY REQUIREMENTS

1.01 SUMMARY

A. The Contractor shall at all times observe and comply with all federal and state laws and lawful regulations issued and local laws, ordinances and regulations which in any manner affect the activities of the Contractor under this contract and further shall observe and comply with all orders or decrees as exist as present and those which may be enacted later by bodies or tribunals having any jurisdiction or authority over such activities of the Contractor.

B. The contractor shall be responsible and liable for all accidents, damage or injury to any person or property resulting from any activity, duty and obligation of the Contractor under this Contract for which the Contractor may be legally liable. The contractor shall hold blameless and harmless and shall indemnify the Owner and its officers, employees and against the any and all claims, demands, loss injury, damage, actions and cost of actions whatsoever which they or any may sustain by reason of any act, omission or neglect of the Contractor or employees, agents, representatives or assignees of the Contractor in connection with the activities, duties and obligations of the Contractor under this Contract.

END OF SECTION

SECTION 01100 – REFERENCE STANDARDS

1.01 GENERAL

A. Abbreviations and Acronyms. Whenever the following abbreviations are used in these specifications or in the drawings, the following definitions apply. Unless otherwise designated, all reference to the following standards, specifications and methods shall imply the latest adopted revision in effect at the time of bid opening. Such standard, except as modified herein, shall have full force and effect as though printed in the specifications.

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Association
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
AWWA	American Water Works Association
EPA	United States Environmental Protection Agency
DEQ	Department of Environmental Quality (both Federal and State)
DWP	Oregon Dept. of Human Services, Drinking Water Program
FM	Factory Mutual
NEC	National Electric Code
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OAR	Oregon Administrative Rules
ODOT	Oregon Department of Transportation
ORS	Oregon Revised Statutes
OSSC	Oregon Structural Specialty Code
OSHA	Occupational Safety and Health Act (both Federal and State)
UL	Underwriters' Laboratories
USDA	United States Department of Agriculture
SSPC	Steel Structures Painting Council or, The Society for Protective Coatings

B. The abbreviation of "N.I.C." if shown on the plans or specifications represents work that is "Not in Contract". This work is to be completed at a later date by Owner or others and for which the Contractor will not be responsible for.

END OF SECTION

SECTION 01300 - SUBMITTALS

1.01 GENERAL

A. This section outlines in general the items the Contractor must prepare or assemble during the progress of the work, including technical submittals, O&M data, record drawings, and substitution requests. Submittals are required for each piece of equipment or material even when the item being proposed for use is the same as specified.

1.02 RELATED SECTIONS

A. General Conditions – Article 6.05, Substitutes and "Or-Equals"
B. Supplementary General Conditions – SGC 6.05
C. General Conditions – Article 6.17, Shop Drawings and Samples
D. Section 01230 – Construction Schedules
E. Section 01630 – Product Substitutions
F. Section 01700 – Closeout Submittals
G. Section 01730 – Operation and Maintenance Manuals
H. Section 01780 – Record Drawings
I. Various sections requiring submittals for equipment and materials

1.03 SUBSTITUTION REQUESTS

A. Where the specifications state "or-equal", "or approved equal", or similar statement, the Engineer alone will determine if the proposed substitute item is allowed.

B. Requests for substitution for items specified by manufacturer or manufacturer's model number as specified throughout the Contract Documents shall be in writing and be accompanied with sufficient information to allow the Engineer to identify the nature and scope of the request. Information to be provided shall include.

1. Reason the substitution request is being made.

2. All submittal information required for the specified item or equipment, including all deviations from the specified requirements necessitated by the proposed substitution.

3. Reproducible contract drawings, marked up to illustrate the alterations to all structural, architectural, mechanical and electrical systems required to accommodate the proposed substitution.

4. If the substitution requires any mechanical, electrical or structural changes, the Contractor will be responsible for costs in evaluating a requested substitution. The cost for such an evaluation will be determined on a case-by-case basis, after receipt of written request. The Engineer will notify the Contractor in writing of said cost. If the Contractor wishes to proceed, he shall advise the Engineer in writing and submit additional information as may be requested. Final approval of a substitution must be made by both the Engineer and Owner.

5. No additional costs of any kind will be incurred by the Owner or Engineer by approval or rejection of any substitution request.

1.04 SUBMITTALS

A. Technical submittals

1. Technical submittals covered by these specifications include manufacturer's information, shop drawings, test procedures, test results, samples, request for substitutions and miscellaneous work related submittals. Submittals shall also include, but not be limited to, all mechanical, electrical and electronic equipment and systems, materials, reinforcing steel, fabricated items, piping and conduit details, and lead time required for delivery to job site.

2. Contractor's Responsibilities

   a. The Contractor shall furnish all drawings, specifications, descriptive data, certifications, dimensional drawings, samples, tests, methods, schedules and manufacturers installation and other instructions as required by the contract documents, or the Engineer, to demonstrate fully that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the contract documents.

   b. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment or method of work shall be as described in the submittal. The Contractor shall verify that all features of all products conform to the specified requirements.

   c. The Contractor shall ensure that there is no conflict with other submittals and notify the Engineer in each case where his submittal may affect the work as shown on the Plans.

   d. The Contractor shall coordinate submittals among his subcontractors and suppliers.

   e. Submittals shall coordinate with the work so that work will not be delayed. Coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals.

   f. The Contractor shall not proceed with work related to a submittal until the submittal process is complete.

   g. The Contractor shall certify on each submittal document that he has reviewed the submittal, verified final conditions and complied with the contract documents. The Contractor may authorize in writing a material or equipment supplier to deal directly with the Engineer. This interaction shall be limited to contract interpretations to clarify and expedite the work.

   h. Charges will be documented and the Contractor will be charged for review of multiple non-conforming submittals for any one (1) item in excess of two (2) times.

1.05 RECORD DRAWINGS

A. During the course of construction, Contractor shall maintain a marked-up set of the project drawings. See Section 01780.

1.06 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Contractor shall collect O&M data from all equipment and material suppliers for all items provided in the project, for review and approval by Engineer and Owner. See Section 01730.

1.07 ENGINEER'S REVIEW

A. Review shall not extend to means, methods techniques, sequences or procedures of construction, or to verify quantities, dimensions, weights or gages, or to fabrication processes, except when specifically indicated or required by the contract documents, or to safety precautions or programs.

B. The Contractor shall submit four (4) copies of all submittal material to Engineer. Two (2) copies will be returned upon final approval. If the submittal is rejected all four (4) copies will be returned.

C. Unless otherwise specified, within 14 calendar days after receipt of submittal, the Engineer will return the marked-up copies. The Contractor shall take appropriate action if the submittal needs to be resubmitted. If specified submittal material is to be used for O&M data, all corrections shall be made and new clean copies shall be submitted with the O&M data.

D. Review of contract documents, method of work or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of his responsibilities for errors therein and shall not be regarded as an assumption of risks or liability by the Engineer or Owner. The Contractor shall have no claim under the Contract on account of failure or partial failure of the method of work, material or equipment so reviewed.

END OF SECTION

SECTION 01310 – CONSTRUCTION PROGRESS SCHEDULES

1.01 GENERAL

A. This section specifies detailed scheduling requirements and procedures including interim and overall schedules.

B. Submittals

1. The Contractor shall submit the following items as specified in this Section:

a. Interim and Overall Pump Station Schedule

b. Interim and Overall Sewer Pipe and Forcemain Schedule

C. Progress of the Work

1. The Contractor shall execute work with such progress as necessary to prevent delay to the overall completion of the project and with such forces, materials and equipment to assure completion in the time established by the Contract.

D. Interim Schedule

1. Contractor shall submit within 10 days after award of Contract, but before any scheduled pre-construction conference, an Interim Schedule setting forth all activities for the first two (2) months of construction.

2. Review comments by the Engineer concerning the Interim Schedule shall be considered in developing the Overall Schedule.

3. The Contractor shall submit three (3) copies of the Interim Schedule.

E. Overall Schedule

1. For Contract Periods exceeding 60 days, the General Contractor shall prepare and submit, within 30 days after the award of Contract, an Overall Schedule composed of all construction operations in connection with the Contract.

2. Overall Schedule, if it is sufficiently developed to equal or exceed the Interim Schedule requirements, may be submitted in lieu of a separately prepared Interim Schedule. In any event, the Interim Schedule shall form the basis for the Overall Schedule and will be considered an integral part of the Overall Schedule.

3. Contractor shall submit three (3) copies to the Engineer for his review. Within seven (7) days after receipt of the submittal, the Engineer shall review the submitted schedule and return one copy of the marked-up original to the Contractor. If the Engineer finds that the submitted schedule does not comply with specified requirements, the corrective revisions will be noted on the submittal copy returned to the Contractor for corrections and resubmitted.

F. Schedule Content

1. Schedules shall indicate the sequence of work and the time of starting and completion of each activity. Activities shall include, but not be limited to, the following items as they pertain to the Contract:

    a. Each subcontractor's items of work

    b. Temporary provisions for continued service

    c. Installation of specific major items

    d. Submittals from Contractor to Engineer for review and return to the Contractor. Material and equipment order, manufacture and delivery

    e. Dates for performance of all testing procedures

    f. Dates for tie-ins to existing systems

    g. Final cleanup and Start-Up

    h. Allowance for inclement weather

2. The schedule duration of each activity shall be based on the work being performed during the normal 40-hour work week with allowances made for legal holidays and normal weather conditions.

3. Schedule shall be updated each month as required, and more often if changes in scheduling are required or if the original schedule is no longer valid.

4. After each revision, the Contractor shall submit the revised schedule to the Engineer.

5. The Contractor shall consider all critical systems and coordinate existing, temporary, and new construction to ensure continuous production of water.

END OF SECTION

SECTION 01400 – QUALITY CONTROL

1.01 GENERAL

A. Work shall conform to these specifications and the standards of quality contained herein.

B. Only new items of recent manufacturer and quality specified, free from defects, will be permitted on the Work, unless items are specifically noted as existing to be reutilized. Remove rejected items immediately from the Work and replace with items of quality specified. Failure to remove rejected materials and equipment shall not relieve the Contractor from responsibility for quality and character of items used, nor from any other obligation imposed by the Contract.

C. No work defective in construction or quality, or deficient in any requirement of the drawings and specifications will be acceptable in consequence of the Owner's or the Engineer's failure to discover or to point out defects or deficiencies during construction; nor will the presence of Resident Project Representatives on the work relieve the Contractor from responsibility for securing the quality and progress of work as required by the Contract. Defective work revealed within the time required by guarantees shall be replaced by the Contractor by work conforming to the intent of the Contract. No payment, whether partial or final, shall be construed as an acceptance of defective work or improper materials.

END OF SECTION

SECTION 01500 – TEMPORARY FACILITIES AND CONTROLS

1.01 GENERAL

A. This section includes mobilization, temporary utilities, temporary construction, safety requirements, temporary environmental controls, and other temporary controls.

B. Submittals

1. Plans for disposal of waste materials and excavated material not required for fill, including permits as required.

C. Permits. Contractor shall secure and pay for all permits and fees required pertaining to temporary facilities and all other work.

D. Mobilization shall include de-mobilization and consist of preparatory work and operations, including but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to and from the project site; for the establishment of offices, buildings and other facilities necessary for work on the project; for premiums on bond and insurance for the project, and for other work and operations which the Contractor must perform or costs he must incur before beginning work on the project and after completion of the project.

E. Access of Government Officials. Authorized representatives of the Federal, State and Local Governments shall at all times have safe access to the Work, whenever in preparation or in progress, and Contractor shall provide proper facilities for such access and inspections.

2.01 MATERIALS

A. Contractor shall provide all materials necessary for all work this Section.

3.01 WORKMANSHIP

A. During all construction operations, the Contractor shall construct and maintain such facilities as may be required to provide access by all property owners to their property. No person shall be cut off from access to their place of business or residence, unless the Contractor has made special arrangements with the affected persons and has notified Engineer and Owner. All temporary facilities shall be removed by the Contractor upon completion of the Work.

B. Temporary Utilities

1. Electric Power and Telephone

a. Electrical power. Power requirements should be confirmed by the Contractor for any special power needs. Arrangements for power shall be the responsibility of the Contractor.

b. Phone service shall be the responsibility of the Contractor.

2. Sanitary Facilities

a. The Contractor shall provide chemical toilets of suitable types and maintain them in a sanitary condition at all times, conforming to code requirements and acceptable to the health authorities. They shall be of watertight construction so that no contamination of the area can result from their use. Arrangements shall be made for frequent emptying of the

toilets. Upon completion of the work, toilets shall be removed and the area restored to its original condition.

b. Portable toilet facilities shall be located only at locations approved by the Owner.

C. Safety Requirements

1. Proper traffic control shall be provided in accordance with Section 01570.

2. Access for Police, Fire, and School Bus Service

a. Notify the fire department, police department and, when applicable, the School District before closing any street or portion thereof, and no closing shall be made without the Engineer's approval. Notify said departments when the streets are again passable for emergency vehicles. Do not block off emergency vehicle access to any area, such as consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, unless the Contractor obtains special written permission from the chief of the fire department. Conduct operations so as to cause the least interference with any fire station access and at no time prevent such access.

b. The Contractor shall furnish a list of emergency telephone numbers to both the Engineer and the Owner so that contact may be made easily at all times in cases of emergencies.

3. Fire Prevention. Contractor shall perform all work in a fire-safe manner. Contractor shall supply and maintain on site all fire-fighting equipment, supplies, and capable personnel for extinguishing incipient fires as required by all Federal, State and local laws and regulations. Each piece of internal combustion engine-driven equipment shall be equipped with a fire extinguisher in accordance with the appropriate recommendation of the National Fire Protection Association (NFPA). All engines shall be equipped with functional spark arrestors and sound suppression devices.

D. Temporary Environmental Controls

1. The Contractor shall maintain affected areas from his construction free from environmental pollution that would be in violation of federal, state or local regulations.

2. Air Pollution Control

a. Minimize air pollution likely to occur from construction operations by wetting down bare soils to control dust and requiring proper combustion emission control devices on construction vehicles.

b. Give unpaved streets, roads, and detours or haul roads in the construction area a dust preventative treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.

3. Water Pollution Control and Erosion Control

   a. Erosion control measures shall be maintained as necessary to ensure their continued effectiveness.

   d. Petroleum products, chemicals, or other deleterious materials shall not be allowed to enter the water.

4.01 PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Mobilization, Bonding, and Insurance - Payment for this item shall be on a lump sum basis at the amount stated on the Bid Form and shall include all activities related to mobilization and demobilization on the project, preparatory work, insurance and bonding costs, project closeout, building permits (as required) and other agency fees and other facilities and equipment necessary for work on the project.

2. Construction Facilities and Temporary Controls - Payment for work in this item shall be on a lump sum basis at the amount stated on the Bid Form and shall include all temporary construction facilities, project offices, miscellaneous equipment, costs related to scheduling, coordination, submittals, and all other Division 1 activities within the scope of work not designated with individual payment items shall be included within this item.

B. Schedule II – Sewer Pipe and Forcemain

1. Mobilization, Bonding, and Insurance - Payment for this item shall be on a lump sum basis at the amount stated on the Bid Form and shall include all activities related to mobilization and demobilization on the project, preparatory work, insurance and bonding costs, project closeout, building permits (as required) and other agency fees and other facilities and equipment necessary for work on the project.

2. Construction Facilities and Temporary Controls - Payment for work in this item shall be on a lump sum basis at the amount stated on the Bid Form and shall include all temporary construction facilities, project offices, miscellaneous equipment, costs related to scheduling, coordination, submittals, and all other Division 1 activities within the scope of work not designated with individual payment items shall be included within this item.

END OF SECTION

SECTION 01570 – TRAFFIC REGULATION

1.01 GENERAL

A. This section includes traffic control related safety requirements as may be required for the project.

B. Contractor shall comply with all rules and regulations of County, State, City, and Federal authorities regarding the closing, detouring, and loading of all public streets or highways.

C. No road (public or private) shall be closed or detoured by the Contractor to the public, except by express written permission of the Engineer and entity governing such roadways. Traffic must be kept open on all roads and streets where no detour is possible. The Contractor shall, at all times, conduct the work so as to assure the least possible obstruction to traffic and normal commercial pursuits. The convenience of the general public and residents, safety, and the protection of property is of prime importance and shall be provided for by the Contractor in an adequate and satisfactory manner.

D. Submittals

1. If road closures, lane closures, or detours are required, Contractor shall prepare, and submit for approval a Traffic Control Plan to the appropriate governing body of such road.

2. Contractor shall submit a traffic control plan and signing plan.

2.01 MATERIALS

A. Contractor shall furnish all flaggers, barricades, lead cars, warning signs, lights, signals, etc. as required to comply with regulations and provide safety.

B. All signs, lights, flags and other warning and safety devices shall meet the current ODOT safety manual affecting the location of construction, or to applicable City/County standards.

C. Barricades shall conform to the Standard Specifications for Highway Construction of the State Highway Department affecting the location of construction, or to City or County Standards where applicable.

3.01 WORKMANSHIP

A. Contractor shall, at their own expense, and without further or other order, provide, erect and maintain at all times during the progress or temporary suspension of the work, suitable barricades, fences, signs or other adequate warnings or protection and shall provide, keep and maintain such danger lights, signals, and flaggers as may be necessary or as may be ordered by the Engineer to insure the safety of the public as well as those engaged in connection with the work.

B. Failure of the Engineer to notify the Contractor to maintain barricades, barriers, lights, flares, danger signals, or watchmen, shall not relieve the Contractor from this responsibility. All barricades and obstructions shall be protected at night by signal lights which shall be suitably distributed and kept burning from sunset to sunrise. Barricades shall be of substantial construction and shall be suitably painted to increase their visibility at night.

C. Whenever the Contractor's operations create a hazardous condition, Contractor shall furnish flagmen and guards as necessary, or as directed, to give adequate warning to the public of any dangerous conditions to be encountered. Contractor shall furnish, erect, and maintain approved fences, barricades, lights, signs, and any other devices that may be necessary to prevent accidents and to avoid damage and injury to the public. Flaggers and guards, while on duty and assigned to give warning to the public, shall be equipped with approved red wearing apparel and a red flag which shall be kept clean and in good repair.

D. Contractor shall provide access to private properties at all times, except during urgent stages of construction when it is impractical to carry on the construction and maintain traffic simultaneously. Coordinate all construction activities with the affected property owners.

E. Contractor shall patrol the traffic-control area and reset all disturbed signs and traffic-control devices immediately, and will remove or cover all non-applicable signs during periods not needed.

F. At the end of each day, the Contractor shall leave work in such condition that it can be traveled without damage to the work and without danger to the public.

G. If, in the opinion of the Engineer or other governing traffic authority, traffic control is lacking or otherwise unsafe or deficient, the Engineer may require that all work be halted until the traffic control measures can be improved to an acceptable level.

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

Payment for this item shall be included within the lump sum price for Construction Facilities and Temporary Controls, unless a line item lump sum bid is shown in the bid form specifically for this item. It shall include all activities related to traffic and safety control on the project and preparatory work for work on the project.

B. Schedule II – Sewer Pipe and Forcemain

Payment for this item shall be included within the lump sum price for Construction Facilities and Temporary Controls, unless a line item lump sum bid is shown in the bid form specifically for this item. It shall include all activities related to traffic and safety control on the project and preparatory work for work on the project.

END OF SECTION

SECTION 01610 – STORAGE AND PROTECTION

1.01 SUMMARY

A. Protect products scheduled for use in the Work by means as described in this Section and as recommended by the manufacturer.

1.02 MANUFACTURER'S RECOMMENDATIONS

A. Except as otherwise approved by the Owner, determine and comply with manufacturers' instructions on product handling, storage and protection.

1.03 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with the labels intact and legible.

B. Maintain packaged materials with seals unbroken and labels intact until time of use.

C. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements at no additional cost to the Owner.

D. The Owner may reject as non-complying such material and products that do not bear identification satisfactory to the Owner as to the manufacturer, grade, quality and other pertinent information.

1.04 STORAGE

A. Store materials on-site in coordination with the Owner to provide suitable site access and clearance.

B. Do not store unnecessary materials that will not be incorporated into the work.

1.05 PROTECTION

A. Protect stored materials from moisture and temperature, and unauthorized handling.

B. Provide protection for finished surfaces.

C. Maintain finished surfaces clean, unmarred and suitably protected until accepted by the Owner.

D. Provide proper protection for all workers.

1.06 REPAIRS AND REPLACEMENTS

A. In event of damage, promptly make replacements and repairs to the approval of the Owner and at no additional cost to the Owner.

B. Additional time required to secure replacements and to make repairs will not be considered by the Owner to justify an extension of the Contract Time of Completion.

C. Repair all scratches and damage to painted surfaces promptly with proper color and material.

END OF SECTION

SECTION 01630 – PRODUCT SUBSTITUTIONS

1.01 SUMMARY

A. This Section describes procedures for securing approval of proposed product substitutions.

1.02 PRODUCT OPTIONS

A. The Contract is based on standards of quality established in the Contract Documents.

1 In agreeing to the terms and conditions of the Contract, the Contractor has accepted the responsibility to verify that the specified products will be available and to place orders for all required materials in such a timely manner as is needed to meet his agreed construction schedule.

2 The Owner has not agreed to the substitution of materials or methods called for in the Contract Documents, except as they may specifically otherwise state in writing.

B. Where materials and methods are specified by naming one single manufacturer or model number, without stating that equal products will be considered, only the material and method named is approved for incorporation into the Work.

C. Where materials and methods are specified by name or product number, followed by the words "or equal approved in advance", materials and methods proposed by the Contractor to be used in lieu of the named materials and methods shall in all ways be equal or exceed the qualities of the named materials and methods. For consideration as an "equal approved in advance", complete detailed submittals (4 copies) must be received by the Engineer at least fourteen (14) days prior to the bid opening date. Approved substitute items will be listed by addendum prior to bid opening.

D. Where the phrase "or equal," or "or approved equal," occurs in the Contract Documents, do not assume that the materials, equipment or methods will be approved as equal unless the item has been specifically so approved for this Work. Prepare detailed submittal and submit to Engineer. Substitutes will not be incorporated into the work unless submittal is approved by the Owner via the Engineer.

E. Submittals shall include all technical information and diagrams as necessary to allow Engineer to evaluate the proposed substitution. Any/all differences between the specifications or specified equipment and the proposed substitution shall be clearly noted in the submittal. Submittals shall clearly indicate the specific model numbers, part numbers, and options of the proposed substitution.

1.03 DELAYS

A. Delays in construction arising because of the time required for approval of substitution requests will not be considered by the Owner as justifying an extension of the agreed Time of Completion.

END OF SECTION

SECTION 01700 – CONTRACT CLOSEOUT

1.01 GENERAL

A. Section includes procedures and requirements for finalizing and closing out the Project(s).

B. Final clean-ups and restorations shall be done prior to requesting final inspections.

2.01 RESTORATION AND CLEAN-UP

A. Upon completion of any portion of the work, promptly remove temporary facilities generated by that portion of the work, including surplus materials, equipment and machinery unless directed otherwise by the Engineer or the Owner. All construction work by the Contractor shall be clean and free of rubbish, dirt, overspray, and extraneous materials to the satisfaction of the Engineer before acceptance of the work.

B. Street/Road Cleanup. All roadways affected during construction shall be cleaned and restored. All ditches and culverts shall be cleaned and re-graded for proper drainage. Culverts broken or damaged by construction activities shall be restored to their original condition and location. Immediately following construction, remove all dirt, mud, rock, gravel, and other foreign material at the completion of the day or as otherwise required by the Engineer.

C. Site Restoration and Cleanup. Restore or replace any ground covering (e.g., bark chips, cinders, gravel, river rock, etc.) to the original condition or better. Replace topsoiled areas, rake and grade to conform to their original contours. Replace any damaged landscaping or plantings to prior conditions in manner acceptable to Owner. Reseed grass areas as approved. Seed and protect any disturbed slopes.

2.02 CERTIFICATIONS

A. Contractor to prepare on Contractor's letterhead with project title and number clearly identified. Submit to Engineer with application for Final Payment.

1. A written certification that Contractor has fully completed the Work in strict compliance with the Contract Documents, and requesting final inspections.

2. Written certification that all subcontractors and suppliers who have furnished work or materials as part of this project have been paid in full.

3. Written certification that Contractor will replace all materials and workmanship that prove defective within one-year after the date of Final Acceptance. Date Engineer signs Final Payment Certificate is date of Final Acceptance and starts the Contractor's one-year guarantee period.

4. Submission of a signed State or Federal approved Wage Certification Form certifying that Contractor has paid not less than the Prevailing Wage Rate as required by law, and that Contractor has timely submitted the required payroll certificates to the appropriate state or federal wage division.

B. One-Year Warranty Inspection. On the 11th month following final project completion and acceptance, Contractor shall be available to be present during the on-site warranty inspection. Any defects identified in materials or workmanship shall be corrected within 30 days by the Contractor at his own expense.

END OF SECTION

SECTION 01730 - OPERATION AND MAINTENANCE MANUALS

1.01 GENERAL

A. This section outlines in general the format and content of O&M Manuals required on the project.

B. Contractor shall collect O&M data from all equipment and material suppliers for all items provided in the project. Data shall be specific to the actual equipment used with specific model numbers and options highlighted. General cut-sheets that do not clearly indicate the specific parts and options provided on this job will not be accepted.

1.02 RELATED SECTIONS

A. Section 01300 – Submittals
B. Section 01700 – Contract Closeout
B. Various sections requiring operation and maintenance data

1.03 SUBMITTALS

A. The Contractor shall submit three (3) hard copies and one (1) software pdf copy of the complete manuals to Engineer prior to substantial completion. The manuals will be reviewed by the Engineer. If complete and acceptable without corrections, Engineer will notify the Contractor in writing and one (1) additional set will be sent to the Engineer by the Contractor.

B. If changes, corrections, or additional information is required, the Engineer will notify the Contractor and may either return one (1) copy, return portions marked-up, or request additional data. Contractor will then resubmit three (3) copies of the corrected manuals. Contractor shall keep copies for their records. This process will continue until Engineer has three complete approved sets.

C. When the manuals are complete and approved by the Engineer, the Contractor will then provide one (1) additional complete set so that Engineer can retain one set and three sets can be delivered to the Owner.

D. Final payment will not be issued until all approved O&M manuals are received.

1.04 QUALITY ASSURANCE

A. Instructions and data shall be prepared by personnel experienced in maintenance and operation of described products.

1.05 FORMAT

A. Data shall be prepared in the form of an instructional manual providing clear information on operational procedures, periodic maintenance requirements, repair procedures, and troubleshooting procedures.

B. Binders shall be commercial quality, 8-1/2 x 11 inch three-ring binders with hardback plastic covers. Maximum binder ring size is 2 inches and multiple volumes will be used as required. Covers shall have a clear outer shell to allow insertion of cover sheet.

C. Each binder shall be identified with a cover that is typed with the title "OPERATION AND MAINTENANCE INSTRUCTIONS", the title of the project, the name of the Owner, and the date of project completion.

D. Each binder shall include a table of contents and tabbed dividers either color coded or with printed labels. Labels shall be permanently affixed. Manual contents shall be arranged by systems and process flow under section numbers and sequence of table of contents.

E. Text shall be manufacturer's printed data or typewritten data on 20 pound bond paper. Drawings shall be provided with reinforced punched binder tab, bound with text, and folded as necessary to the size of text pages.

1.06 CONTENT

A. The first sheet inside the cover shall provide the title of project; names, addresses and telephone numbers of the Engineer; names, addresses and telephone numbers of the general contractor with the names of responsible parties.

B. For each product or system, provide the names, addresses, and telephone numbers of subcontractors and suppliers, including local sources of supplies and replacement parts.

C. Product Data: Section sheet shall clearly identify specific products, component parts, and data applicable to the installation.

D. Drawings shall supplement product data to illustrate relations of component parts of equipment and systems to show control and flow diagrams.

E. Materials and Finishes

1. Building products, applied materials, and finishes shall include product data with catalog number, size, composition, and color and texture designations.

2. Instruction for care and maintenance shall include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and schedule for cleaning and maintenance.

F. Equipment and Systems

1. For each item of equipment and each system, a description of the unit or system component parts, identification of function, normal operating characteristics, and limiting conditions; and performance curves, engineering data and tests, and complete nomenclature and commercial number for replaceable parts.

2. Electrical service characteristics, controls, and communications for panelboard circuits. Color coded wiring diagrams as installed.

3. Operating procedures. Start-up, break-in, and routine normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and any special operating instructions.

4. Maintenance Requirements. Routine procedures and guide for troubleshooting, disassembly, repair, and reassembly instructions; and alignment, adjusting, and checking instructions.

   a. Servicing and lubrication schedules and list of lubricants required.
   b. Manufacturer's printed O&M instructions
   c. Sequence of operation by controls manufacturer
   d. Parts lists, illustrations, assembly drawings and diagrams
   e. Control diagrams

f. Charts of valve tag numbers
g. List of manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage
h. Additional data requirements as specified in individual product sections.

END OF SECTION

SECTION 01740 – WARRANTIES

1.01 GENERAL

A. Installed Materials Warranties. Prior to 75% completion and payment for work under this Contract, the Contractor shall furnish the Owner through the Engineer, all warranty and/or guarantee forms normally furnished by the manufacturer of equipment. Warranty form shall include the specific equipment installed, the duration of the warranty, details of the warranty, and the installer's name, address and phone number. Installation date will be filled in by the Owner and will coincide with date of substantial completion of the work under this contract. All such warranties shall name the Owner as the warranted party.

a. Attention is directed to various other sections of the Contract Documents where specific material or installation warranties may be required for items specified.

B. Contractor shall guarantee the Work for a period of one (1) year from the date of Final Acceptance. All materials and workmanship that prove defective within the one-year guarantee period shall be promptly replaced or corrected with no additional cost to the Owner. Written certification that Contractor will replace all materials and workmanship that prove defective within one-year after the date of Final Acceptance is required for project close-out and shall accompany application for Final Payment.

END OF SECTION

SECTION 01780 - PROJECT RECORD DRAWINGS

PART 1 – GENERAL

1.01 SUMMARY

A. This section outlines in general the Contractor requirements for preparing and maintaining and record drawings of the project.

B. Contractor shall provide access to the Record Drawings to the Engineer and Owner throughout construction and shall finalize and submit complete record drawings upon completion of the work.

C. Accurate Record Drawings or "As-Builts" are considered extremely important and it shall be entirely the Contractor's responsibility to maintain a complete and accurate record of all details of the project as he constructs and installs equipment and materials.

D. Engineer or Owner may stop work if it is determined that Contractor is not properly recording details in record drawings and require correction and accurate documentation of all previous work before additional work proceeds.

E. Engineer must accept and approve the drawings prior to recommending final payment.

1.02 RELATED SECTIONS

A. General Conditions – Article 6.12, Record Documents

1.03 SUBMITTALS

A. Submit two complete sets of initial marked-up Record Drawings immediately upon completion of construction work. Engineer will review for completeness and either approve or return one set with comments and corrections.

B. If initial submittal required corrections, submit one complete set of corrected marked-up Record Drawings to Engineer with or before request for final payment.

PART 2 – PRODUCTS

2.01 RECORD DRAWINGS

A. Maintain one set of black-line prints of the Contract Drawings. Mark-up drawings using erasable red-colored pencil. Use additional colors as necessary to clearly document changes from original drawings for different categories of work at the same location.

B. Use clear original or copy of project drawings for mark-up. Use shop drawings for markup when they are more capable of showing actual physical conditions completely and accurately.

C. All deviations or differences from the original drawings, including dimensional, location, layout, material, and other details shall be noted clearly. Any additional information discovered during construction shall also be noted including location and depth of buried utilities and structures not shown in the original drawings.

2.02 FORMAT

A. Organize Record Drawings into manageable sets using plans and shop drawings as applicable. Keep sets bound and protected.

B. Keep on-site during construction and clearly identify as "Record Drawing" on cover.

PART 3 – EXECUTION

3.01 RECORDING AND MAINTENANCE

A. Record data as soon as possible after obtaining it. Do not wait until the end of the job or a portion of the job to record data.

B. Give particular attention to information concealed that would be difficult to identify or measure and record later. Record and check the markup before enclosing concealed installations.

C. Require the individual who installed or constructed the portion of the work, or otherwise obtained the record data, to prepare that portion of the marked-up record print.

D. Incorporate changes and additional information previously marked on Record Drawings, erase, redraw, and add details and notations where applicable.

E. Refer instances of uncertainty to Engineer for resolution.

END OF SECTION

DIVISION 2- SITE WORK
TABLE OF CONTENTS

SECTION 02240 – CONTROL OF WATER

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section covers the control of surface water runoff, dewatering of pipeline trenches and structural excavations, bypass pumping of sanitary sewer systems, and other elements required for control of water.

B. The design, installation, and operation of the temporary pumping system shall be the Contractor's responsibility. The Contractor assumes all liability for operation of the by-pass system and shall man the system during its operation. The by-pass system shall meet the requirements of all codes and regulatory agencies having jurisdiction of the system operation.

C. Submittals

1. Prior to performing any excavation, the Contractor shall submit a dewatering plan to the Engineer for review. The submittal shall include method of installation and details of the proposed dewatering system.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials and equipment required for control of water shall be furnished and maintained as required to perform the construction.

B. Pumps

1. Bypass pumps, if required, shall be fully automatic, solids handling, self-priming units.

2. Contractor shall supply all necessary stop/start controls for each pump.

3. Backup pumps shall be available in the case of a primary pump failure.

C. Piping/Hose

1. Contractor shall provide temporary discharge piping constructed of rigid pipe with positive restrained joints.

2. No aluminum irrigation type piping to be allowed.

3. Discharge hose may be allowed for short sections with prior Engineers review and approval.

4. Provide watertight pipe system.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. The necessary machinery, appliances and equipment shall be provided and operated to keep excavations free from water during construction, and to dispose of the water so as not to cause injury to public or private property or to cause a nuisance or a menace to the public. Sufficient pumping equipment and machinery in good working condition shall be provided for all emergencies including power outage, and sufficient workmen shall be available at all times for the operation of the pumping equipment. The dewatering systems shall not be shut down between shifts, on holidays or weekends, or during work stoppages without written permission from the Engineer.

B. The control of groundwater if present shall be such that softening of the bottom of excavations, or formation of "quick" conditions or "boils" during excavation, shall be prevented. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils. Natural or compacted soils softened by saturation with groundwater or standing surface water shall be removed and replaced as instructed by the Engineer at no additional expense to the Owner.

C. During construction of structures, installation of pipelines, placing of structure and trench backfill and the placing and setting of concrete, excavations shall be kept free of water. Surface runoff shall be controlled so as to prevent entry or collection of water in excavations. The static water level shall be drawn a minimum of one (1) foot below the bottom of the excavation, so as to maintain the undisturbed state of the foundation soils and allow the placement of fill or backfill to the required density. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

D. Open and cased sumps shall not be used as primary dewatering for excavations deeper than three (3) feet below the static water table. Location of open or cased sumps shall be outside of trench excavation or limits of structural excavation.

E. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures and pipelines.

F. Provisions shall be made to take care of surplus water, mud, silt or other runoff pumped from excavations and trenches or resulting from slicking or other operations. Siltation of completed or partially completed structures and pipelines by surface water or by disposal of water from dewatering operations shall be cleaned up at the Contractor's expense.

G. The Contractor shall be responsible for any damages to existing on- and off-site facilities and work in-place resulting from mechanical or electrical failure of the dewatering system.

H. The Contractor shall comply with all applicable local, State, and Federal laws and regulations pertaining to erosion control and discharge of water off-site.

I. Necessary filtering media, bags, or other methods shall be used to ensure that turbidity limits in the receiving bodies are not exceeded during dewatering activities.

J. Sanitary Sewer Bypass Pumping. Pump shall be suitably sized to handle all incoming flows. Bypass pumping shall be provided continuously until normal flow patterns in sanitary sewers can be reestablished.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Bypass Pumping of sewage flows shall be made on a lump sum basis at the price stated on the Bid Form. Payment shall include all equipment, labor, and materials required to provide continuous bypass pumping of sewage flows during replacement of the sanitary sewer piping as shown on the Plans.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Control of Water and other work in this Section shall be included within the unit prices for sewer lines and associated appurtenance items. A separate payment will not be made for this item.

END OF SECTION

SECTION 02250 – DEMOLITION AND SITE PREPARATION

PART 1 GENERAL

1.01 SUMMARY

A. The work in this section includes the furnishing of all labor, equipment, materials, incidentals, and performing all work required for the removal and disposal of concrete, miscellaneous structures, sewer piping as designated for removal, debris and other items or improvements of manmade origin, in accordance with the Plans and these Specifications.

B. The removal work described herein does not include the removal or disposal of items or improvements designated to remain.

C. The area in which removal work, under these Specifications, is to be performed shall be confined to the minimum dimensions, within the public right-of-way or easements, which will permit proper construction of the proposed improvements, or as otherwise indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete shall be as specified in Section 03300.

B. Select fill and Backfill shall comply with Section 02315.

D. Landscape restoration and reseeding shall be as specified in Section 02900.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Pavements, Curbs, Walks and Driveways

1. Where construction operations require the removal of pavements and other concrete flatwork or structures, bituminous pavements or portions thereof, the area to be removed shall be neatly sawcut. Just prior to placement of hot ac pavement final sawcuts shall be made 6-inches outside the limits of the trench on each side to a depth of 1½-inches, or deeper as required, to permit the removal of material without damage to adjoining portions of structures to be left in place. All cuts shall be clean, vertical cuts made true to lines designated or approved by the Engineer. See Detail drawings for further clarification.

2. The Contractor shall remove and dispose of all pavement and structures, or portions thereof, which lie within the limits of excavation.

3. Pavements and/or structures designated to remain but damaged as a result of the Contractor's operations shall be sawcut and removed as described above, and replaced or restored at the sole expense of the Contractor.

B. Removal and Disposal of Asbestos-Containing Pipe

1. Removal of Asbestos-Containing Pipe

a. When existing pipe containing asbestos (i.e. Transite or AC Pipe) is exposed, cut or removed, all requirements of the EPA, Oregon DEQ, and OR-OSHA shall be followed. Specific guidelines pertaining to the handling and removal of asbestos-containing materials are given in OAR 340-248 and OAR 437, Division 3, Construction. The Contractor is required to be familiar with these and all other requirements related to the removal, handling and disposal of asbestos-containing material, and shall comply with all such laws and regulations.

b. All asbestos-containing pipe that is not removed or otherwise disturbed shall be left or abandoned in place. The location of all such pipe shall be documented by the Contractor on the As-Built plans.

2. Disposal of Asbestos-Containing Pipe

a. All asbestos-containing pipe that is removed from the ground or otherwise disturbed must be handled and disposed of in compliance with the guidelines of OAR 340-248 and OAR 437, Division 3, Construction. The asbestos-containing pipe must be adequately wetted to prevent the release of asbestos fibers during cutting and handling. Asbestos-containing materials must be disposed of in leak-tight 6-mil thick plastic bags, plastic-lined cardboard containers or plastic lined metal containers, in accordance with the above requirements.

b. The sealed containers of asbestos-containing pipe shall be hauled to an approved asbestos landfill and disposed of according to DEQ regulations and the landfill requirements.

c. The Contractor shall take special precautions to protect the integrity of the asbestos-containing pipe and prevent the release of asbestos during the handling, loading and transportation of the pipe.

C. Valves and valve covers, fittings, and other pipe appurtenances designated for removal shall be removed in their entirety to the limits shown on the Plans, or as required to permit proper construction of the proposed improvements. Remaining ends of pipes shall be suitably capped or plugged in a watertight manner. Provide a minimum of two (2) feet of concrete slurry filling inside of pipe for full diameter.

D. Salvaged Materials

1. Frame and cover sets, gratings, water system components, valves and other reusable materials from removed or abandoned structures and systems shall remain the property of the City and shall be salvaged as directed by the City Engineer and delivered to the City's storage yard by Contractor.

a. Materials to be salvaged and returned to the City include: Fire hydrant, water valves, pump station hydroranger, and overflow flow meter.

2. Other salvageable materials shall become the property of the Contractor and shall be disposed of by the Contractor away from the site.

a. Salvaged materials of any kind shall not be reused in new work without the written approval of the Engineer.
b. Items to be salvaged include: Gates Valves, Check Valves and Instrumentation.

E. Abandonment of Existing Structures

1. Structures to be abandoned in place shall be removed to a depth indicated on the Plans. Exposed pipes shall be plugged with concrete and the remainder of the structure filled with ¾ -inch or 1-minus crushed aggregate.

2. Wetwell shall be cleaned of all sewage, grit and sludge prior to abandonment.

3. Interior surfaces of the ends of pipes to be abandoned shall be cleaned prior to constructing permanent plugs. Concrete plugs shall be constructed in the ends of all pipe 18-inches in diameter or less. Concrete pipe shall be at least 8-inches thick.

F. All items and materials designated to remain shall be protected against damage as required. Damage to items or materials not intended for removal shall be repaired promptly by the Contractor to the satisfaction of the affected property owner. If the Engineer determines it necessary, repairs shall consist of complete replacement of the affected items or materials. All such repairs and replacements shall be made by the Contractor without compensation.

G. Disposal of Materials

1. All materials, except those determined by the Engineer or Owner to be reusable, shall become property of the Contractor at the place of origin and shall be disposed of by the Contractor in conformance with all laws, regulations and rules legally imposed on such activities.

   a. Contractor shall make every effort to salvage or recycle construction demolition items and debris as is feasible.

2. Materials shall not be disposed of on District owned or District controlled lands except by written permission of the District, and if so permitted, the materials shall be placed only at such locations and in such manner as District may direct. Materials may be disposed of on private properties only with written permission of the property owner(s) involved, and with copies of the agreement furnished to the District and Engineer.

H. Excavations resulting from the removal of structures and/or obstructions shall be backfilled and compacted in accordance with the requirements of Section 02315. Backfill materials shall consist of the type and class designated on the Plans and specified in Section 02315.

G. All existing ditches damaged by the Contractor by his operations and incidental ditching shall be re-constructed as required as to maintain existing drainages and ditches. The Contractor shall maintain channel width and side slopes of existing conditions.

H. 1. Existing sanitary sewer pipe and laterals where designated shall be removed entirely to the limits shown on the Plans or to the limits as required to facilitate proper installation and connection of new facilities.

2. Existing sanitary sewer manholes where designated for removal shall be removed to the limits shown or described on the Plans & Specifications or to the limits as required to facilitate the proper abandonment of existing facilities and installation and placement of new facilities.

3. Manhole Abandonment & Removal

A guideline for the abandonment or removal of existing manholes is as follows:

a. Remove existing frame, lid and top cone section of manhole.

b. Plug existing 8 inch pipe with concrete and fill remaining portion of manhole with sand.

c. Backfill remaining excavation with class "B" backfill material and restore surrounding grade and gravel surfaces.

4. Abandon Piping

a. A short portion of the existing 16 inch mainline is to be abandoned in place.

b. Exposed ends of remaining mainline or lateral shall be suitably capped or plugged in a watertight manner and pack end with a concrete slurry to seal completely.

c. Existing forcemain shall be filled with concrete slurry and capped and plugged in a watertight manner.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT (Schedule I and II)

A. Payment for Demolition & Site Preparation shall be made on a lump portions basis for the amount stated on the Bid Form. Payment shall include compensation for all work described herein for the removal and disposal of portions of sewer pipe, structures and obstructions as required for the proposed improvements. Contractor shall sequence his work in such that no disruption existing service or system occurs unless said disruption is approved by the Engineer.

B. Measurement and payment for abandonment of those portions of the existing mainline and laterals shall be included within the lump sum cost of Demolition & Site Preparation. A separate payment will not be made for this item.

C. Measurement and payment for the removal and disposal of excavated material for the removal and abandonment of existing manhole and appurtenances and backfill shall be included within the lump sum cost of Demolition & Site Preparation as stated on the Bid Form. A separate payment will not be made for this item.

D. Measurement and payment for ac pavement excavation and disposal, backfill and other preparation of trenches shall be included in the lineal foot cost for gravity and pressure sewer pipe.

E. The Cost for sawcutting existing pavement adjacent to new utility trenches shall be considered incidental to the work. No additional compensation will be allowed for sawcutting.

F. Measurement and payment for ac pavement replacement shall be as specified in Section 02740.

G. No additional compensation will be allowed the Contractor for the handling, removal or disposal of any asbestos-containing pipe encountered during construction.

END OF SECTION

SECTION 02260 - SHORING AND BRACING

1.01 GENERAL

A. This section specifies requirements for shoring and bracing of trenches and other excavations as required to furnish safe and acceptable working conditions, protect existing and new structures and vegetation and maintain existing slopes, fills and open excavations.

B. The Contractor shall have sole responsibility to determine the construction means and methods required to satisfy the requirements of this section. The Contractor shall design sheeting, shoring and bracing in accordance with Oregon Occupational Safety and Health Act (OSHA).

C. The Contractor shall furnish a safe place of work pursuant to the provisions of OSHA and the subsequent amendments and regulations and for the protection of the work, structures and other improvements.

D. Shoring and bracing shall include all necessary sheeting, sloping and other means and procedures such as draining and recharging groundwater and routing and disposing of surface runoff, required to maintain the stability of soils.

E. Slope Stability

1. OSHA Health and Safety Standards for Excavation, 29 CFR Part 1926, or successor regulations shall be strictly enforced and, if they are not followed, the Contractor and/or earthwork and utility subcontractor could be liable for penalties.

2. Owner and/or Engineer may stop work at any time if Contractor is deemed to be performing work in an unsafe manner.

2.01 MATERIALS - NOT USED

3.01 WORKMANSHIP

A. General

The construction of sheeting, shoring and bracing shall not disturb the state of soil adjacent to the excavation or below the excavation bottom. Sheeting, shoring and bracing shall be removed after placement and compaction of initial backfill, except as otherwise specified.

B. Structure and Existing Piping

The Contractor shall provide support of existing and new structures where shown, specified and at all other locations where excavation infringes on a 1:1 slope extending from the bottom of the footing. Existing piping shall be protected with shoring and bracing where excavation could expose the pipe and/or cause damage to the pipe.

C. Damages

Any damages to new or existing structures occurring through settlements, water or earth pressures, or other causes due to failure or lack of sheeting, shoring or bracing, or through negligence or fault of the Contractor shall be repaired by the Contractor at his

own expense.

4. PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for all shoring, bracing and other work in this section shall be included within the lump sum basis for the amount stated on the Bid Form for the Pump Station Improvements.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for shoring, bracing and other work in this Section shall be included within the unit prices for sewer lines and associated appurtenance items. A separate payment will not be made for this item.

END OF SECTION

SECTION 02315 – TRENCH EXCAVATION, BEDDING AND BACKFILL

PART 1 GENERAL

1.01 SUMMARY

A. This work consists of furnishing all labor, materials, incidentals and equipment, as well as performing all work required for excavation, foundation stabilization, pipe bedding, pipe zone material, trench backfill, compaction, final grading, hauling and disposal of material resulting from the construction of sewer piping, manholes, and all related appurtenances. Included also is the locating and protecting of existing utilities and other improvements (see Division 1), shoring, bracing, and dewatering of excavations, excepting only such work as is covered and included under other sections of this Division, or other Divisions of these Contract Documents.

B. Excavation must be in accordance with ORS 757.541 to 757.571 and all other applicable laws and regulations.

1.02 REFERENCES

A. Oregon Standard Specifications (OSS) – The Joint Oregon Department of Transportation/APWA Oregon Chapter Standard Specifications for Construction.

1.03 DEFINITIONS

A. Trench Excavation – Trench excavation consists of the removal of all material encountered in the trench to the limits shown on the Plans or as directed. Trench excavation shall be classified as either common excavation or rock excavation.

1. Common excavation is defined as the removal of all material as required to complete the planned improvements, regardless of type, nature or condition of materials encountered, except that which is designated as rock excavation.

2. Rock excavation is defined as the removal of boulders composed of igneous, sedimentary or metamorphic stone material which have a least dimension of 36-inches or more, or a displacement of one cubic yard or more; or the removal of solid ledge rock which, in the opinion of the Engineer, requires for its removal drilling and blasting, wedging, sledging, barring or breaking with power operated tools.

a. No soft or disintegrated rock; hard-pan or cemented gravel that can be removed with a hand pick or power operated excavator or shovel; no loose, shaken, or previously blasted rock or broken stone in rock fillings or elsewhere; and no rock outside of the minimum limits of measurement allowed, which may fall into the excavation, will be measured or allowed.

b. When solid rock layers have an overburden of non-rock material (common material) which cannot practically be stripped and handled separately, and/or when solid rock is interspersed with non-rock material, the entire mass will be classified as solid rock if the actual solid rock fraction exceeds 85% of the entire volume.

B. Trench Foundation – Trench foundation is defined as the bottom of the trench on which the pipe bedding is to lay and which provides support for the pipe.

C. Foundation Stabilization – Foundation stabilization is defined as the furnishing, placing and compacting of specified materials for any unsuitable material removed from the bottom of an excavation, as directed by the Engineer, to provide a firm trench foundation.

D. Pipe Bedding – Pipe bedding is defined as the furnishing, placing and compacting of specified materials on the trench foundation so as to uniformly support the barrel of the pipe. The total bedding depth shall be a minimum of 6-inches below the outside bell of the pipe.

E. Pipe Zone – Pipe zone is defined as the furnishing, placing and compacting of specified materials for the full width of the trench and extending from the top of the bedding to a level 10-inches above the top outside surface of the barrel of the pipe. Specified zone material to be placed in this region in conformance with these Specifications.

F. Trench Backfill – Trench backfill is defined as the furnishing, placing and compacting of material in the trench extending from the top of the pipe zone to the bottom of pavement base, ground surface or surface material. Plans generally show locations for each type of backfill class.

G. Drain Rock – Drain rock is defined as the furnishing, placing and compacting of specified free draining material for the full width of the drain trench (perforated pipe drains) and extending to a level as specified above the top outside surface of the pipe barrel.

PART 2 PRODUCTS

2.01 MATERIALS

A. Trench Foundation – The trench foundation shall be undisturbed native material when suitable. Where ground water or other unstable conditions exist and the native material cannot properly support the pipe, additional excavation may be required. The trench shall be stabilized with foundation stabilization material when such conditions are present in the opinion of the Engineer.

B. Foundation Stabilization – Foundation Stabilization: 1½"-0 or 2"-0 aggregate base rock meeting OSS Sections 00641 and 02630. Required when native trench foundation material contains groundwater, or is unsuitable to provide a firm foundation in the opinion of the Engineer.

C. Pipe Bedding – Material for pipe bedding shall be clean, hard, sound, durable, well-graded, ¾-inch minus pea gravel or crushed rock, free from organic matter. Engineer must approve material prior to use.

D. Trench Backfill

1. Class "A" Backfill: Native or common excavated material, free from organic or other deleterious material, free from rock larger than 3-inches, and which meets the characteristics required for the specific surface loading or other criteria of the backfill zone in the opinion of the Engineer. If stockpiled material becomes saturated or unsuitable, Class B, C or D Backfill shall be substituted. Engineer must approve material prior to use.

2. Class "B" Backfill: ¾"-0 dense-graded aggregate, uniformly graded from coarse to fine and meeting OSS Section 02630.10.

3. Class "C" Backfill: Clean sand with no particles larger than ¼-inch.

4. Class "D" Backfill: Pit run or bar run material, well graded from coarse to fine, with maximum aggregate size of 3 inches.

5. Class "E" Backfill (CLSM or CDF): Controlled Low-Strength Material (cement slurry) conforming to OSS Section 00442.

   a. Slurry shall consist of a highly flowable lean concrete mix; mixture of Portland cement, fly ash, fine aggregates, water and admixtures as required for a mixture that results in a hardened, dense, non-settling, hand excavatable fill.

PART 3 EXECUTION

3.01 GENERAL

A. Remove, haul, and dispose of all formations and materials, natural or man-made, irrespective of nature or conditions encountered, within lines and grades shown on the Plans or defined herein, and as necessary for completion of the proposed improvements. The method of excavation shall be as determined by the Contractor, and as required for special protection of existing improvements. Special care shall be taken to avoid overexcavation below subgrades. Store and protect materials suitable for use as backfill where applicable. Clearing and Grubbing and Removal of Structures and Obstructions to be completed prior to excavation.

B. When the precise location of subsurface structures and/or utilities is unknown, locate such items by hand excavation prior to utilizing mechanical excavation equipment. Use hand excavation when mechanical equipment might damage existing improvements which are to remain undisturbed. See Division 1 for other requirements.

C. Incidental to excavation shall be the furnishing, installing and removal of all shoring, sheeting, bracing and dewatering equipment as required to support adjacent earth banks and structures, keep excavations free from excess water, and to provide for the safety of the public and all personnel working in excavations.

3.02 EXCAVATION

A. Excavate to the lines and grades shown on the project Plans, allowing for forms, shoring, working space and gravel base. Provide minimum 6-inch clearance around pipe barrel in all directions or greater in accordance with the standard trench detail drawing.

B. Shoring and Bracing

1. Sheet and brace excavation as necessary to prevent caving and to protect adjacent structures, property, workers and the public.

2. All sheeting, shoring and bracing shall conform to safety requirements of OSHA and other Federal, State and local agencies.

3. Shoring and bracing loads and recommendations are provided in the January 3, 2011 Foundation Report and Seismic Hazard Study prepared by Foundation Engineering, Inc. (FEI). A representative of FEI must be present during installation of sheet piles or slide rail system, and preparation of the excavation.

C. Dewatering

1. Furnish, install and operate all necessary machinery, appliances and equipment to keep excavations free from water during digging and initial backfilling. Dispose of water in such a manner as to prevent damage to public or private property, or nuisance or menace to the public.

2. At all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outage. Have available, at all times, competent workers for operation of the equipment.

3. Control surface runoff to prevent entry or collection of water within excavations. All excavations shall be kept free of water during placement of backfill and/or concrete placement.

4. Comply with all laws regarding stormwater runoff, protection of natural resources, and other applicable laws and regulations.

5. Dewatering recommendations are provided in the January 3, 2011 Foundation Report and Seismic Hazard Study prepared by Foundation Engineering, Inc. (FEI). Contractor shall conform to recommendations within the FEI report.

3.03 FOUNDATION STABILIZATION

A. The contractor shall overexcavate the trench to firm undisturbed soils or rock when, in the opinion of the Engineer, the trench foundation materials are not suitable for the support of the pipe. Foundation Stabilization materials, as specified, shall be placed and compacted in lifts not exceeding 6-inches in compacted thickness to the required grade. Each lift shall be compacted to at least 95% relative compaction in accordance with ASTM D698.

3.04 DISPOSAL OF EXCESS MATERIALS

A. Excavated materials not suitable or required for backfill shall be hauled away and disposed of on approved sites arranged by the Contractor. No site shall be used for disposal of materials without written approval of the property owner. All costs associated with the hauling and disposal of materials shall be borne by the Contractor. The Contractor shall be entitled to any proceeds received from the sale of excess materials.

3.05 TEMPORARY STOCKPILING

A. Place excavated materials suitable for use as backfill (and not excess material) only within construction easements, right-of-way, or approved work area. Stockpiles shall be placed in such manner as to provide the minimum inconvenience to the public.

B. The Contractor shall obtain written permission from any property owners prior to placement of stockpiles on private property. Provide copies to the Owner and Engineer. Remove stockpiles as soon as possible and restore sites to affected property owners' satisfaction.

C. Access to all fire hydrants, water valves and meters shall be maintained. Stockpiles shall not be permitted to block any stormwater drainage ditches, gutters, drain inlets, culverts or natural water courses.

D. Protect stockpiled material which is to be later incorporated into the work so that excessive wetting or drying of the material does not occur. Material shall be brought to near optimum moisture content prior to placement and compaction. Depending on the moisture content of stockpiled materials, necessary processing may include aeration,

mixing and/or wetting. No additional payment will be allowed for protecting or preparing native backfill materials.

E. If approved native materials become unsuitable (too wet or mixed with unsuitable materials) due to negligence by the Contractor, then imported granular materials may be required for backfilling at the subject location at no additional cost to the Owner.

F. Provide necessary protection for stockpiled materials so that silt-laden runoff does not occur during rain events and to prevent wind-blown dust from stockpiles.

3.06 TRENCH BACKFILL

A. Place and compact pipe bedding material before placing pipe in the trench. Dig depression for pipe bells to provide uniform bearing along the entire pipe length. Thoroughly compact bedding material.

B. Place materials in the pipe zone in layers not greater than 6 inches thick and in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure thorough contact between the material and the pipe. Before placing the pipe zone material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content.

C. Contractor shall backfill the trench above the pipe zone in successive lifts not exceeding 12-inches in loose thickness. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Each lift shall be compacted, using suitable mechanical or pneumatic equipment, to a minimum of 95% of the maximum dry density as determined by ASTM D698. If the specified compaction is not obtained, the Contractor may be required to use a modified compaction procedure and/or reduce the thickness of lifts. If approved materials meeting the specifications cannot be compacted to the required density regardless of compactive effort or method, the Engineer may reduce the required density or direct that alternate materials be used. In no case shall excavation and pipe laying operations proceed until the Contractor is able to compact the backfill to the satisfaction of the Engineer.

D. CLSM. When CLSM Backfill is required, backfill above pipe zone with CLSM material. If the CLSM is to be used as a temporary surfacing, backfill to top of the trench and strike off to provide a smooth surface. If CLSM is not to be used as a temporary surface, backfill to bottom of the proposed resurfacing. Use steel plates to protect the CLSM from traffic a minimum of 24 hours.

E. When backfilling is complete, the Contractor shall finish the surface area as specified. In paved or graveled areas the Contractor shall maintain the surface of the trench backfill level with existing adjacent grades with ¾"-0 crushed rock until pavement replacement is completed and accepted by Owner.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for all Trench Excavation, Bedding and placement of Backfill shall be included within the lump sum basis for the amount stated on the Bid Form for the Pump Station Replacement.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Trench Excavation, Bedding and Backfill shall be included within the unit prices for sewer lines and associated appurtenance items. Price will include all such trench work and materials required for each backfill class and size and type of pipe as shown in the Bid Form. A separate payment will not be made for this item.

2. Where gravel backfill is used through gravel shoulders and gravel roadways the backfill shall be brought to the finish grade of the existing shoulder and gravel roadway and shall be included in the unit prices for waterlines. A separate payment shall not be made for this item.

3. Payment for Foundation Stabilization will be made on a cubic yard basis, truck measure. Payment shall include all excavation, removal and disposal of existing materials excavated and placement of new foundation material.

END OF SECTION

SECTION 02316 – EXCAVATION AND SELECT (STRUCTURAL) BACKFILL

PART 1 GENERAL

1.01 SUMMARY

A. This work consists of furnishing all labor, materials, incidentals and equipment, as well as performing all work required for excavation and structural fill placement for the pump station.

B. Excavation must be in accordance with ORS 757.541 to 757.571 and all other applicable laws and regulations.

C. Adhere to rules and recommendations of the Oregon Department of Environmental Quality *Erosion and Sediment Control Manual*, most recent edition.

D. Excavation and backfill work at the pump station site shall comply with 2010 Geotechnical Investigation Report prepared by SHN Consulting Engineers & Geologists, Inc. as directed.

1.02 REFERENCES

A. Oregon Standard Specifications for Construction (OSS) – 2008 Oregon Department of Transportation/APWA Oregon Chapter Standard Specifications for Construction.

B. Oregon Department of Environmental Quality (DEQ) *Erosion and Sediment Control Manual,* most recent edition.

1.03 DEFINITIONS

C. Excavation – excavation consists of the removal of all material at site to the limits shown on the Plans or as directed. Excavation shall be classified as either common excavation or rock excavation as specified in Section 02315.

D. Foundation – foundation is defined as the bottom of the excavated area on which the granular pad is to lay and which provides support for the pipe and granular pad.

E. Foundation Stabilization – Foundation stabilization is defined as the furnishing, placing and compacting of specified materials for any unsuitable material removed from the bottom of an excavation, as directed by the Engineer, to provide a firm foundation.

F. Select Fill – Select fill is defined as furnishing, placing and compaction of specified material for the entire excavated area for granular pad.

PART 2 PRODUCTS

2.01 MATERIALS

A. Granular Pad Foundation – The trench / granular pad foundation shall be undisturbed native material when suitable. Where ground water or other unstable conditions exist and the native material cannot properly support the pipe or granular pad, additional excavation may be required. The excavation shall be stabilized with foundation stabilization material when such conditions are present in the opinion of the Engineer.

B. Foundation Stabilization – Foundation Stabilization: 1½"-0 or 2"-0 aggregate base rock meeting 2008 OSS Sections 00641 and 02630. Required when native excavation foundation material contains groundwater, or is unsuitable to provide a firm foundation in the opinion of the Engineer.

C. Select Fill - select fill shall consist of 1"-0 or 1 ½"-0, dense-graded, crushed aggregate base rock meeting 2008 OSS Section 02630.10. Engineer must approve material prior to use.

D. Geo-Fabrics

1. Separation Liner (fabric) shall be provided beneath granular pad and native bearing soil and shall have a mean average roll value (MARV) strength properties meeting the requirements of AASHTO M 288-2000 Class 2 geotextile (geotextile for separation) with a permittivity greater than 0.05 sec. $^{-1}$ and an apparent opening size less than 0.6 mm.

2. Filter Fabric shall consist of a non-woven geotextile with a grab tensile strength greater than 200 lbs and an apparent opening size (AOS) of between #70 and #100 (U.S. Sieve) and a permittivity greater than 0.1 sec. $^{-1}$.

3. Specification sheet to be submitted on selected geotextiles for approval prior to order and delivery to site.

PART 3 EXECUTION

3.01 GENERAL

A. Remove, haul, and dispose of all formations and materials, natural or man-made, irrespective of nature or conditions encountered, within lines and grades shown on the Plans or defined herein, and as necessary for completion of the proposed improvements. The method of excavation shall be as determined by the Contractor, and as required for special protection of existing improvements. Special care shall be taken to avoid overexcavation below subgrades. Store and protect materials suitable for use as backfill where applicable. Clearing and Grubbing and Removal of Structures and Obstructions to be completed prior to excavation.

B. When the precise location of subsurface structures and/or utilities is unknown, locate such items by hand excavation prior to utilizing mechanical excavation equipment. Use hand excavation when mechanical equipment might damage existing improvements which are to remain undisturbed. See Division 1 for other requirements.

E. Excavation shall be done in accordance with the Recommendations for Design and Construction of the 2010 Geotechnical Investigation Report prepared by SHN Consulting Engineers & Geologists, Inc. as directed. Subgrade shall be inspected by SHN Consulting Engineers & Geologists, Inc. (geotechnical engineer) prior to compaction or placement of select fill.

C. Shoring and Bracing

1. Sheet and brace excavation as necessary to prevent caving and to protect adjacent structures, property, workers and the public.

2. All sheeting, shoring and bracing shall conform to safety requirements of OSHA and other Federal, State and local agencies.

D. Dewatering

1. Furnish, install and operate all necessary machinery, appliances and equipment to keep excavations free from water during digging and initial backfilling. Dispose of water in such a manner as to prevent damage to public or private property, or nuisance or menace to the public.

2. At all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outage. Have available, at all times, competent workers for operation of the equipment.

3. Control surface runoff to prevent entry or collection of water within excavations. All excavations shall be kept free of water during placement of backfill and/or concrete placement.

4. Comply with all laws regarding stormwater runoff, protection of natural resources, and other applicable laws and regulations.

5. Dewatering recommendations are provided in the August, 2010 Geotechnical Investigation Report prepared by SHN Consulting Engineers and Geologists, Inc. Contractor shall conform to recommendations in the report.

3.02 EXCAVATION

A. Excavate to the lines and grades shown on the project Plans, allowing for forms, shoring, working space and gravel base.

3.03 FOUNDATION STABILIZATION / OVER EXCAVATION

A. Foundation stabilization shall be placed and compacted in accordance with the recommendations of the Geotechnical Report.

B. The contractor shall over excavate the pipeline trench to firm undisturbed soils or rock when, in the opinion of the Engineer, the trench foundation materials are not suitable for the support of the pipe. Foundation stabilization materials, as specified, shall be placed and compacted in lifts not exceeding 6-inches in compacted thickness to the required grade. Each lift shall be compacted to at least 95% relative compaction in accordance with ASTM D698.

3.04 DISPOSAL OF EXCESS MATERIALS

A. Excavated materials not suitable or required for backfill shall be hauled away and disposed of on approved sites arranged by the Contractor. No site shall be used for disposal of materials without written approval of the property owner. All costs associated with the hauling and disposal of materials shall be bourn by the Contractor. The Contractor shall be entitled to any proceeds received from the sale of excess materials.

3.05 INSPECTION

A. Contractor shall notify Engineer not less than 48 hours prior to required inspections. Required geotechnical inspections shall not be waived and work shall not proceed until inspection has been completed and the Contractor has been authorized to proceed by the Engineer.

inspection has been completed and the Contractor has been authorized to proceed by the Engineer.

a. Geotechnical Engineer shall inspect excavated subgrade under the wetwell prior to subgrade compaction or placement of select fill. Engineer may require adjustment to the subgrade, compaction of the subgrade, or other action depending on actual conditions.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station Improvements

1. Payment for Excavation and placement of Backfill and Select Fill shall be included within the lump sum basis for the amount stated on the Bid Form for the Pump Station Improvements Project.

END OF SECTION

SECTION 02320 – BYPASS PUMPING

PART 1 GENERAL

1.01 SUMMARY

A. This work in this section includes the furnishing of all labor, equipment, materials, incidentals, and performing all work required to implement a temporary bypass pumping system for the purpose of diverting sanitary sewer flows around the designated work zone for the project duration.

B. The operation, design and installation of the temporary bypass pumping system shall be the responsibility of the Contractor. The Contractor assumes all liability for the operation of the bypass pumping system and shall man the system during its operation. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction of the systems operation.

C. Submittals

1. Prior to the start of any excavation the Contractor shall submit a bypass pumping plan to the Engineer for review. The submittal shall include the method of installation and details of the proposed bypass pumping system.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials and equipment required for the bypass pumping equipment shall be furnished and maintained as required to perform the sanitary sewer line replacement.

B. Pumps

1. Bypass pumps shall be fully automatic, solids handling, self priming units.

2. Contractor shall supply all necessary start/stop controls for each pump.

3. Backup pumps shall be available in the case of a primary pump failure.

C. Piping/Hose

1. Contractor shall provide temporary bypass discharge piping constructed of pipe with positive restrained joints.

2. Use of discharge hose may be allowed for short sections with prior Engineers review and approval.

3. Discharge piping system shall be watertight. Contractor shall perform pressure and leakage tests on the bypass pumping system prior to start of operation of the system.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. It is essential to the operation of the existing sanitary sewer system that there will be no interruption in the flow of sewerage during the duration of the project. Operation of the bypass pumping system shall maintain the sanitary sewer flows around the work area in such a manor as not to cause surcharging of upstream and downstream sewers, damage to existing sewers, and will protect both public and private property from flooding and damage.

B. Contractor shall provide, maintain and operate all temporary facilities such as dams, plugs, primary pumping equipment, back up pumping equipment, bypass piping and all necessary power, labor and equipment as required to intercept the sewage flow prior to interfering with the work area. Flows shall be conveyed past the work area and returned to the existing sewer system at a point downstream of the work area.

1. After projects completion and installed plugging is no longer required, plugging shall be removed in such a manner that permits sewerage flow to return to normal without surcharging downstream the existing system.

C. The Contractor shall provide the design, installation and operation of the temporary bypass pumping system. The Contractor shall assume responsibility of such bypass pumping system. Bypass system shall meet the requirements of the Oregon Department of Environment Quality (DEQ) and any other State, County or local agencies having jurisdiction over the operation of such facilities.

D. The Contractor will not be permitted to stop mainline flows under any circumstances without prior approval from District or the Engineer.

E. The Contractor shall assume liability for providing all necessary means to convey sewage past the work area.

F. All water resources, wetlands and other natural resources shall be protected from discharge of sanitary sewers.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for all Bypass Pumping shall be included within the lump sum basis for the amount stated on the Bid Form for the Pump Station Improvements.

B. Schedule II – Sewer Pipe and Forcemain

a. Payment for Bypass Pumping shall be included within the unit prices for sewer lines, manholes and associated appurtenance items. A separate payment will not be made for this item.

END OF SECTION

SECTION 02321 – COMPACTION TESTING

PART 1 GENERAL

1.01 SUMMARY

A. The Contractor shall retain and pay for the service of an approved, recognized independent testing laboratory to conduct laboratory tests on materials and field testing to determine the relative compaction of trench backfill, subgrades, embankments, gravel surfacing, aggregate base and asphalt concrete pavement, as indicated. The approved Testing Agency shall recommend methods of compaction to Contractor and issue final report to the Owner, through the Engineer, regarding compaction testing results and material compliance with the specifications.

B. These specifications call for field compaction efforts to achieve a specified relative compaction for each of the indicated classes of backfill. Determination of in-place density shall be made by means of non-destructive nuclear probe method testing in accordance with ASTM D2922-01 and ASTM D3017-01 test methods.

1.02 DEFINITIONS

Relative Compaction -- The ratio, expressed as a percentage, of the in-place density of the Engineered fill material to the maximum density of the same material as determined by the ASTM D698 Standard Test Method.

PART 2 PRODUCTS

2.01 APPROVED TESTING AGENCIES

A. Foundation Engineering; 820 N.W. Cornell Ave; Corvallis, OR 97330; (541) 757-7645

B. Western Testing; 3329 N.E. Stephens; Roseburg, OR 97470; (541) 957-1233

C. Western Testing; 2455 Maple Leaf, Bay #4; North Bend, OR 97459; (541)266-9875

D. Other certified private testing laboratory approved by Engineer

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Field Testing

1. Testing to determine the relative compaction of materials placed and compacted by the Contractor shall be performed a short distance behind construction. Tests shall be taken on each lift of the material prior to placement of the succeeding lift to ensure proper compaction is obtained. The Testing Agency shall perform testing at such locations and elevations as to be representative of the entire material and area being compacted. The Engineer shall have authority to require testing at times and locations he deems necessary.

2. A sufficient number of density tests shall be taken on the first section of subgrade and trench backfill placed by the Contractor to establish the effectiveness of the Contractor's compactive efforts. If tests indicate that the specified relative

compaction for a given material is not being achieved, the Contractor shall modify compaction methods in order to obtain the specified results.

3. A minimum of four (4) tests shall be required to be taken during each site visit. It is estimated that two (2) site visits will be required for this project.

B. Failing Tests – For areas failing to meet the specified compaction, the Contractor shall be responsible to perform all additional work necessary to achieve specified compaction at no additional cost to the Owner. Additional work may include further compactive effort, moisture treatment, other compaction methods, removal and replacement of failing materials, or other processes required to obtain the specified results.

C. Any subsequent settlement of backfilled areas during the one-year warranty period shall be considered to be the result of insufficient compaction, and shall be promptly repaired by the Contractor at no additional cost to the Owner.

D. The Contractor shall not be allowed any additional compensation for down time incurred as a result of compaction testing or waiting for test results.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Trench Excavation, Bedding and placement of backfill shall be included within the lump sum basis for the amount stated on the Bid Form.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Compaction Tests shall be included within the unit prices for sewer lines, service laterals and associated appurtenance items. The price shall include compensation for all costs associated with compaction testing, including sampling, laboratory testing, field testing, administration, and all other work required to obtain certification of backfills placed under this Contract for each type of pipe as shown in the Bid Form.

a. Only Compaction Tests with results meeting the requirements of these Specifications will be accepted. All costs associated with or arising from additional work required due to failing compaction test results, including removal and replacement of material, shall be borne by the Contractor.

b. Contractor must submit invoice from Testing Agency clearly identifying Project, location and date of testing, material tested, test method, test results, specified compaction, maximum dry density of material tested, and number of tests taken. Only tests directed by the Engineer and which obtain passing results will be paid for.

END OF SECTION

SECTION 02512 – PERFORATED DRAIN PIPING

PART 1 GENERAL

1.01 SUMMARY

A. The work in this Section consists of furnishing all labor, materials, equipment and performing all work necessary for the proper installation of the perforated drain piping to provide drainage as indicated on the Plans and/or required for the completion of the proposed project.

B. Perforated drain piping shall either be a polyvinyl chloride rigid pipe (PVC) or a high density polyethylene flexible pipe (HDPE).

PART 2 PRODUCTS

2.01 MATERIALS

A. PVC pipe and fittings for perforated drain piping shall conform to Class 12454-B as defined in ASTM D1784. Neoprene gaskets with push on joints shall conform to ASTM F477.

B. HDPE pipe shall be a bell and spigot design and shall include a rubber gasket conforming to ASTM F477.

C. Perforated drain piping shall consists of a 4 inch perforated or slotted pipe around installed under the fill area and behind the retaining wall.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. All pipe and fittings shall be installed in accordance with manufacturer's recommendations and shall be placed to lines and grades as shown on the plans.

B. Pipe shall be wrapped in a geo-textile filter fabric and placed in a bed of at least four inches of drain rock. Drain rock shall be backfilled to within six inches of the surface with the entire mass of drain rock being wrapped in a geo-textile filter fabric.

C. Provide cleanouts and appurtenances as shown on the plans for future maintenance and cleaning of the drainage system.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Perforated Drain Pipe and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 02530 – GRAVITY SEWER PIPE AND FITTINGS

PART 1 GENERAL

1.01 SUMMARY

A. This section covers gravity sewer pipe materials for sewer mains and service laterals, including fittings, anchors, complete installation and testing.

B. All work shall conform to the latest version of the Oregon Standard Specifications (OSS) Part 00400, except as specified herein and shown on the Plans.

PART 2 PRODUCTS

2.01 MATERIALS

A. All pipe, fittings and appurtenances shall be new and unused.

B. 4-inch through 15-inch PVC Gravity Sewer Pipe and Fittings

1. Unplasticized polyvinyl chloride (PVC) plastic gravity sewer pipe with integral wall bell and spigot joints for the conveyance of domestic sewage. Pipe shall be colored green for identification as sewer pipe. Pipe shall be furnished in 20-foot laying lengths. Pipe shall meet ASTM D3034 and have an SDR of 35.

2. PVC compounds shall meet the requirements of ASTM D1784, cell classification 12454-B.

3. Bells shall consist of an integral wall section with a solid cross-section rubber ring, factory assembled, and securely locked in place to prevent displacement during assembly. Spigot ends shall be supplied from the factory with beveled ends. Joints shall provide a tight flexible seal meeting the requirements of ASTM D3212. Material used for elastomeric seal in push-on joints shall meet the requirements of ASTM F477.

4. All fittings and accessories shall be as manufactured and furnished by the pipe supplier, or approved equal, and shall have bell and/or spigot configurations compatible with that of the pipe. Fittings shall meet the same requirements as the pipe.

5. All fittings and appurtenances required to construct laterals and cleanouts shall be PVC and provided by or approved by the same manufacturer as the sewer piping. This shall include all tees, caps, wyes, couplings and other required fittings.

6. Pipe and fittings shall be Ring-Tite PVC Gravity Sewer Pipe and Fittings as manufactured by J-M Manufacturing Company, Inc.; or approved equal.

C. Appurtenances

1. Transition couplings and same diameter couplings for new sewer lines, unless otherwise specified, shall be flexible rubber with stainless steel bands. Fernco, or approved equal. Rotate coupling so type and size wording is visible from top to allow for inspection.

2. PVC pipe connections to concrete manholes shall utilize appropriately sized flexible, watertight seal adapters designed for such use. Adapters shall be tested watertight to a minimum of 10.8 psi during factory testing. Adapters shall be for connections to precast concrete shall be KOR-N-SEAL as manufactured by NPC, Inc.; or approved equal. Adapters for connections at cast-in-place manhole bases shall be made with a rubber waterstop grouting ring. Ring shall clamp to pipe with stainless steel clamp and have waterstop ribs. Waterstop Grouting Ring by Press-Seal Gasket Corp., or approved equal

3. New service lateral connection to existing sewers shall utilize one of the following clamp on style saddles:

   a. Molded PVC saddle with neoprene rubber seal to sewer main, gasket branch, and stainless steel straps; conform to ASTM D3034; GPK or approved equal.

   b. Cast ductile iron saddle with virgin SBR gasket and adjustable 3½" wide stainless steel strap; Romac Style "CB" or approved equal.

4. Manufactured tees shall be required for service lateral connections to new mains and lateral reconnections to existing mains where use of saddles is not feasible. Tees shall conform to subsection 2.01.B. above.

5. Cleanouts shall be constructed of the same PVC material as used to construct the service lateral piping. Cleanout size, fittings, and cleanout cover shall be as shown in the Standard Detail Drawings.

D. Concrete shall conform to Oregon Standard Specifications Section 00440, Commercial Grade Concrete. Compressive field strength shall not be less than 3,000 psi at 28 days. Maximum aggregate size shall be 1½-inches. Slump shall be between 2 and 4 inches.

E. Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes.

PART 3 EXECUTION

3.01 PIPE INSTALLATION

A. PVC gravity pipe shall be installed, stored and handled in accordance with the manufacturer's installation guide, the Uni-Bell PVC Pipe Association Installation Guide for PVC Sewer Pipe, ASTM D2321, and these specifications.

B. Remove material from job site, which in the judgment of the Engineer is damaged, not as specified, or otherwise rejected. Payment will not be made for damaged or rejected materials, their removal, or for repairs to such materials.

C. Preparation of Trench – Excavate and prepare trench for pipe laying to the lines and grades as specified and shown on the Plans. Place any required foundation stabilization and compact pipe bedding prior to laying pipe. Stabilize trench as required and comply with OSHA safety provisions.

D. Place and compact pipe bedding material before placing pipe in the trench. Dig depression for pipe bells to provide uniform bearing along the entire pipe length. Thoroughly compact bedding material to prevent future bellies.

E. Prior to lowering pipe into the trench, the Engineer and City representative will check for damage to the pipe. The Contractor shall repair or replace, as directed, all damaged or flawed pipe prior to installation.

F. Thoroughly clean inside the pipe before laying. Prevent foreign material from entering the pipe while it is being placed in the trench. Remove all foreign material from the inside of the pipe and joint before the next pipe is placed. Keep debris, tools, rags or other materials out of the pipes at all times. When pipe laying is not in progress, seal the open end of the pipe with a watertight plug, or by other approved means to prevent the entry of trench water or other foreign materials into the pipe.

G. Lay pipe with bell ends facing the direction of laying. For lines on an appreciable slope, face bells up-grade unless otherwise directed by the Engineer. Thoroughly clean the ends of the pipe to remove all foreign matter from the pipe joint. Lubricate the bell and spigot ends with approved pipe lubricant, as recommended by the manufacturer.

H. Tolerance. For gravity pipelines, vertical deviation from true grade shall not exceed 0.02 feet (0.24 inch). Horizontal tolerance for deviation from line shall be 0.03125 feet (3/8 inch). Depressions or bellies which create the potential for solids deposition are not allowed.

I. Care must be taken to ensure the pipe is not moved and the side support fill is not disturbed when moving sheeting or trench boxes.

J. Place materials in the pipe zone in layers not greater than 6 inches thick and in a manner that equalizes the pressure on the pipe and minimizes stress. As required under the haunches of pipe and areas not accessible to mechanical tampers or to testing, compact with hand methods to ensure thorough contact between the material and the pipe. Before placing the pipe zone material, condition, aerate, or wet the material so that the moisture content of each layer is within minus 4% to plus 2% of optimum moisture content.

K. Provide proper Backfill Class material as required. Backfill the trench above the pipe zone in successive lifts. Do not allow the backfill to free-fall into the trench until at least 3 feet of cover is provided over the top of the pipe. Modify the compaction as necessary to protect the pipe. Compact each lift to not less than 95% of the maximum density.

L. All pipes shall be thoroughly flushed with water prior to testing. Removal of water and debris shall be accomplished by exposing the pipe on the low end of the gravity main in each section and pumping water from the trench to the ground surface for disposal. The Contractor shall be responsible for the removal of all debris that enters into the sewer system from construction. All costs associated with removal of such debris shall be the responsibility of the Contractor and result in no additional costs to the Owner.

M. Service laterals shall be installed at a minimum 2% slope from the mainline or manhole to the connection with the existing lateral from the building, unless otherwise approved by the Engineer. Provide couplings for connection to existing service laterals. Coordinate with home-owner.

N. Service Lateral Connections

1. Service lateral connections shall include the connection of any new or existing service lateral to the main at locations shown on the Plans. Service laterals shall be connected to the main using new manufactured tees or wyes, as specified. In general, tees will be used where new laterals are being added along new mains or where existing laterals are being replaced and reconnected to the new main.

2. The Contractor shall install new PVC tees or wyes with manufactured bends as shown on the Standard Details. Service lateral piping shall be extended from the new connection to the point where the existing service lateral crosses into the public right-of-way, and connected to the existing piping.

3. The Contractor shall provide a minimum of 1-hour notice to any existing user prior to cutting the user's service lateral and thereby disrupting service. Lateral replacement shall be completed within 4-hours or the Contractor will be required to provide bypass pumping for the affected service.

4. The Contractor shall be responsible for all exploratory excavation and/or video inspection necessary to locate existing service laterals.

5. Service laterals shall be neatly cut at the property line and removed to the point of connection to the mainline. Reconnection to existing lateral piping shall be made using an appropriately sized transition coupling, as specified. The contractor shall install new PVC cleanouts at property line as shown on the Standard Details.

6. Where existing tees on the sewer main are cracked, broken, or otherwise unusable, the Contractor shall install a new tee and necessary mainline piping in order to provide a watertight connection for the lateral.

O. After installation and compaction of backfill, all pipe shall be thoroughly flushed and then subject to either hydrostatic or low-pressure air testing. Pipe will also be tested for deflection and will be video inspected.

3.02 MANHOLE CONNECTIONS

A. Where shown on the Plans or directed by the Engineer, the Contractor shall connect new sewer piping to existing manholes.

B. Core drill the manhole wall using appropriately sized core drill for the new pipe. Jack-hammering will not be allowed. Install pipe in accordance with Section 02535 using KOR-N-SEAL boot.

C. When an existing manhole has a poured-in-place base or other obstruction at the pipe level and core drilling is not feasible, contractor may jackhammer to provide penetration for new or replacement pipe. Install pipe in accordance with Section 02535 using Waterstop Grouting Ring.

D. Install flexible transition couplings on all pipes within 2 feet of the outside walls of manholes. Provide a watertight connection.

E. Modify the base of the manhole in accordance with Section 02535-3.03.

3.03 PLUG AND ABANDON PIPING/LATERALS

A. Install an appropriately sized mechanical plug at least 2-feet into the pipe or lateral designated for plugging or abandonment.

B. Concrete slurry for sealing sewer lines and laterals being abandoned shall consist of 2 sacks of Portland cement per cubic yard of cement sand. Water shall be added at such a ratio as to provide a 4-inch slump.

C. Concrete slurry shall be packed into the end of the pipe up to the mechanical plug and troweled flush with the end of the pipe.

3.04 LOW-PRESSURE AIR TESTING OF GRAVITY SEWER (per UNI-B-6-98 / ASTM F1417)

A. The Contractor shall furnish all equipment, materials and personnel required for properly conducting all required low-pressure air testing under observation of the Engineer. Pressure gauge shall have 0.10 psi increments and an accuracy of 0.0625-psi. Testing equipment must include a pressure relief device designed to relieve pressure at a maximum of 9 psi and must allow continuous monitoring of the test pressure to avoid excessive pressure. All air used shall pass through a single control valve. Only qualified personnel shall be permitted to conduct the test. The Time Pressure Drop Method shall be used.

B. Testing shall be performed in the presence of the Engineer or a City representative. Testing shall be conducted after backfilling and compaction has been completed to finish grade. Notify Engineer at least 2 working days in advance.

C. Initial Test – A test shall be conducted on the first section of pipe laid by each crew to establish that the pipeline installation is capable of preventing excessive infiltration. The section of pipeline tested shall be at least 300 feet in length. If the test indicates exfiltration exceeding the amount the amount hereinafter specified, all defective materials and/or workmanship shall be corrected and the test rerun until leakage is within the specified limits.

D. If, in the opinion of the Engineer, the water-tightness of the pipe is in question during installation, the Engineer may require the Contractor to test the pipe sections in question. Such testing shall not be considered adequate for final pipe testing, performed after the pipe is installed, backfilled, and cleaned. Thereafter all sewer pipe shall be tested as provided herein.

E. The Contractor may desire to make air tests prior to complete backfilling, for his own purposes; however, acceptance air test shall be made only after installation of all laterals and backfilling has been completed and compacted.

F. It is extremely important that all plugs, including end of service laterals, be installed and braced such that blowouts are prevented (ex. 250 lbs force is exerted on an 8" plug at 5 psig). Exercise care to prevent excessive pressures. Keep workers out of manholes until pressure is released.

G. Testing Procedure

1. Immediately following pipe cleaning, the pipe installation shall be tested with low pressure air. Each pipe section between manholes shall be tested. Service laterals from the main to the property line shall be included in the test.

2. Check the average height of ground water over the pipe invert. The test pressure required below shall be increased 0.433 psi for each foot of average water depth over the pipe (ex. If groundwater is 2.8 feet above pipe invert, add 1.2 psig to test pressures). Method used to determine groundwater depth shall be acceptable to the Engineer.

3. Air shall be slowly supplied to the plugged pipe until internal air pressure reaches 4.0 psi greater than the average back pressure of any ground water that may submerge the pipe. Do not exceed a total pressure of 9.0 psig.

4. After the internal test pressure is reached, at least two minutes shall be allowed for the air temperature to stabilize. After the stabilization period, disconnect the air supply.

5. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5 psig (greater than average backpressure of any groundwater over the pipe). At a reading of 3.5 psig, or any convenient pressure between 3.5 psig and 4.0 psig (above groundwater pressure), timing shall commence with an accurate stop watch.

6. Acceptance - The tested section shall be considered acceptable if the required testing time has elapsed before a 1.0 psig pressure drop has occurred. If the pressure drops 1.0 psig before the minimum length of time has elapsed, the air loss rate is considered excessive and the section of pipe has failed the test.

7. Acceptance criteria is based on an allowable air loss of Q=0.0015 cfm per ft^2 of internal pipe surface area less than 625 ft^2. This results in a total allowable loss of 625Q = 0.94 cfm. The shortest time (T), in seconds, allowed for the air pressure to drop 1.0 psig is calculated with the following formula:

   T = 0.085 (DK/0.0015)

   K = 0.000419DL but not less than 1.0, D = pipe I.D. in inches, and L = length of pipe tested in feet.

8. Contractor shall record and document the testing procedure and results during the testing process. The UNI-Bell "Air Test Data Sheet" or similar approved equal shall be used and submitted to the Engineer. Record the diameter (in), length (ft), start and end manhole numbers, time, date, pressure drop, and groundwater level on inspection form.

Minimum Specified Time Required for 1.0 PSIG Pressure Drop

Pipe ø (in)	T_{min} (min:sec)	L for T_{min} (ft)	T for longer L (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	.380L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15

If no pressure drop (0 psig) has occurred after 1 hour, test may conclude and section passes

9. Service laterals shall be included in test however the length of service laterals may be ignored and the length of main line only used in the above table. If desired, length of service laterals included in test section may be included in the calculation by following the method outlined in UNI-B-6-98 Section 9.4.

3.05 HYDROSTATIC TESTING OF PIPE

A. Hydrostatic testing may be done in lieu of low-pressure air testing.

B. Contractor shall provide all hose, temporary piping, approved pipe plugs, tank trucks, and other equipment, labor and material required to make the hydrostatic tests, and shall pay for the water used, unless otherwise approved by the Engineer. Testing of the pipe shall be conducted in the presence of the Engineer. Testing shall be conducted after backfilling and compaction has been completed to finish grade. Notify Engineer at least 2 working days in advance.

C. Prior to making exfiltration leakage tests, contractor may fill the pipe with clear water to permit normal absorption into the pipe walls; provided however, that after filling the pipe, leakage testing shall be completed within twenty-four (24) hours after filling. When under test, allowable leakage shall comply with the following requirements:

Leakage shall not exceed 0.04 gallons per hour per inch diameter per one hundred (l00) feet of sanitary sewer pipe, with a minimum test pressure of six (6) feet of water column above the highest section of pipe (including service laterals), or above the active ground water table, whichever is higher as determined by the Engineer. The length of pipe tested shall be limited so that the pressure on the invert of the lower end of the section tested shall not exceed 28 feet of water column, and in no case shall be greater than 500 feet. All service connection footage shall be taken into account in computing allowable leakage. Test duration shall be at least 2 hours. Methods of imposing the water column and measuring the water loss shall be acceptable to the Engineer.

3.06 DEFLECTION TESTING OF FLEXIBLE PIPE

A. In addition to air or hydrostatic testing, the contractor shall conduct deflection tests of sanitary sewers constructed of flexible pipe. Testing will consist of pulling an approved mandrel through the completed pipeline after backfill and compaction to finish grade is complete. Testing shall be conducted in the presence of the Engineer.

B. Diameter of the mandrel shall be at least 95% of the pipe internal diameter. Mandrel shall have at least 6 vanes.

C. Testing shall be done from manhole to manhole. Pipe shall be thoroughly cleaned and flushed prior to pulling the mandrel. Mandrel shall pass smoothly through the pipe without excessive effort.

D. Testing shall be conducted only after at least 30 days have elapsed after backfill and compaction was completed. May be conducted concurrently with video inspection.

3.07 VIDEO INSPECTION OF GRAVITY SYSTEMS

A. All gravity sewer lines constructed as part of the project shall be televised and taped at the end of construction prior to acceptance. Taping shall be conducted after all backfill and compaction, but prior to final surface restoration. All pipes shall be thoroughly flushed by the Contractor immediately prior to the video inspection. A 1-inch target ball shall be placed in front of the camera. The video shall be recorded in color on DVD format. Sufficient light shall be provided to show detail. Camera speed shall not exceed

3 feet per second. Camera shall have a swivel head capable of looking up each service connection. A copy of the video tape and a written TV Inspection Report shall be furnished to the Engineer. Any sections of sewer pipe not meeting specifications or exhibiting defects shall, at the Contractor's expense, be corrected to meet specification. Repaired sections shall be re-televised. All repairs must be completed before acceptance of the project.

B. The sanitary sewer lines constructed as part of the project will also be video inspected near the end of the one year warranty period to determine if any defects exist in the system. The warranty video inspection will be conducted during a season of high groundwater as close to the end of the warranty period as possible. The warranty period will continue to be in effect, regardless of duration, until all video recordings are received and approved. All defects in the system will be corrected at the Contractor's expense.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Gravity Sewer Pipe and Fittings shall be included within the lump sum basis for the amount stated on the Bid Form.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Gravity Sewer Pipe & Fittings will be made on a lineal foot basis for each size, backfill class, for depths less than twelve (12) feet, and for depths greater than twelve (12) feet, at the unit prices stated on the Bid Form. Payment shall include compensation for trench excavation, shoring and bracing, pipe zone, pipe, backfill, anchors, fitting, transition couplings, appurtenances, testing, video inspection and all related work. Measurement will be made along the pipe centerline.

2. Payment for Manhole Connections to existing manholes will be made on a unit price basis per each regardless of size at the price stated on the Bid Form. Payment shall include compensation for all materials, equipment and labor for a complete water-tight connection including: coring or jack-hammering, flexible rubber boot or water stop ring, transition coupling, and appurtenances for a complete installation.

END OF SECTION

SECTION 02531 – LOCATOR WIRE AND WARNING TAPE

PART 1 GENERAL

1.01 SUMMARY

A. This section consists of furnishing all labor, material and equipment, and performing all work required for the burying of an insulated copper conductor wire and plastic underground warning tape in the trench with installed non-ferrous and/or nonconductive (plastic, etc.) sewer pipe. See the Standard Detail Drawings for trench cross section.

PART 2 PRODUCTS

2.01 MATERIALS

A. Toning wire shall be No. 12 AWG, solid copper with green colored insulation. Insulation shall be 30 mil thick HDPE designed for direct bury.

B. Underground warning tape shall be 6-inch wide, 4-mil thick, APWA Standard Green color, reading "CAUTION – BURIED SEWER LINE BELOW."

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Wire and warning tape shall be buried the entire length of the trench, placed in accordance with the Standard Detail Drawings, for all nonconductive pipelines.

B. Wire shall be brought to the surface and connected at each manhole and sewer cleanout. Distance between tracer lead access locations shall not exceed 1,000 feet. All joints and/or splices in the wire shall be made with a designed waterproof splice kit. Wire shall be taped to pipe every 5 feet and shall be run straight with a small amount of slack. Wire shall be routed outside each manhole or cleanout riser. Wire shall be exposed inside all cleanout covers and a minimum of 24" of wire provided. At manholes, pass wire into manhole between concrete grade ring and manhole lid frame and provide a minimum of 24" coiled wire.

C. Warning tape shall be placed over the pipe zone material, approximately 15 to 18 inches below finish grade, in accordance with the Standard Detail Drawings. Lay tape flat and untwisted, centered over the pipe and with wording facing upwards.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for Locator Wire and Warning Tape shall be included within the lump sum basis for the amount stated on the Bid Form.

B. Schedule II – Sewer Pipe and Forcemain

a. Payment for locator wire and warning tape shall be included within the lineal footage prices for each size and backfill class of sewer pipe to be installed. No additional compensation will be allowed.

END OF SECTION

SECTION 02535 – MANHOLES AND APPURTENANCES

PART 1 GENERAL

1.01 SUMMARY

A. This section covers manholes, frames, covers, adapters, and other manhole appurtenances not specifically paid for in other sections, used in the gravity sewer collection system and outfall line. See Standard Detail Drawings.

B. All manholes, frames and covers supplied under this contract shall be from the same manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manholes

1. Manhole riser sections shall be pre-cast reinforced concrete with a minimum wall thickness of 5 inches, conforming to ASTM C 478. Concrete used in forming the sections shall have a minimum compressive strength of 4000 psi at 28 days. Reinforcing steel shall be Grade 60.

2. Manholes shall have precast reinforced concrete bases with shelves, channels and slopes as specified. Precast bases shall have same wall thickness and reinforcement as riser sections.

3. Joints between manhole sections as well as base section shall be tongue and groove with an o-ring gasket or approved equal conforming to ASTM C-443. Preformed gaskets shall be Ram-Nek, Kent-Seal No. 2, or approved equal

4. Manholes shall have yard permeability tests passing ASTM C497-03 prior to delivery. Manhole steps shall be plastic with ½" grade 60 steel reinforcing bars encapsulated with injection molded copolymer polypropylene with serrated surfaces.

B. Frames and Covers

1. All frames and covers shall be heavy duty, gray cast iron designed for H20 traffic loading. Metal used in the castings shall conform to ASTM A48 Class 30. All castings shall be manufactured true to pattern, uniform in quality, free from blowholes, shrinkage, distortion or other defects. Component parts shall fit together in a satisfactory manner and shall have continuously machined bearing surfaces to prevent rocking and rattling. Castings shall be smooth and well cleaned by shotblasting at the factory.

2. Frames and covers shall have skid resistant surface of raised knobs or indentations. Cover shall have the word "SEWER" cast into it. Non-watertight lids shall have two vent holes.

3. Frames and covers shall be manufactured in accordance with the dimensions shown in the Standard Detail Drawings; Olympic Foundry, or approved equal.

C. Manhole Connections

1. Connections to precast manhole sections shall be accurately core-drilled and shall utilize a properly sized flexible rubber boot providing a watertight seal. Adapter shall be factory tested for watertightness up to 10.8 psi. Kor-N-Seal as manufactured by NPC, Inc. or approved equal.

2. Connections to cast-in-place concrete shall be made with a rubber waterstop grouting ring. Ring shall clamp to pipe with stainless steel clamp and have waterstop ribs. Waterstop Grouting Ring by Press-Seal Gasket Corp., or approved equal.

D. Grout

1. Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes

PART 3 EXECUTION

3.01 MANHOLE INSTALLATION

A. Prepare native soil and place and compact the crushed rock base to 95% maximum dry density as shown in the Standard Detail Drawings. Backfill material around manholes shall be as specified for trenches in Section 02320.

B. Concrete base shall be carefully placed on the prepared bedding so as to be fully and uniformly supported at true grade and alignment.

C. Pipe penetrations shall be core drilled to the appropriate size for each pipe entering or exiting the manhole. Jackhammering will not be allowed. Install appropriately sized KOR-N-SEAL boot on each pipe and apply non-shrink grout to remainder of wall penetration to provide positive seal. Non-shrink grout shall be as specified.

D. Install transition couplings, per Section 02530, within 2 feet of the outside wall of manholes on all pipes; or, a pipe bell shall be located a minimum of 1 foot to a maximum of 2 feet from the outside wall of manholes.

E. All flow channels within precast bases shall be constructed of non-shrink grout with a minimum depth of three-fourths (¾) the contributing pipe diameter. Inverts shall be true to line and grade with flow lines having a minimum drop of 0.2 feet from inlet to outlet. Sides of channels shall be troweled smooth to prevent solids deposition. Ledges or benches shall be sloped towards channel to drain. Provide fine broom finish on ledges.

F. Clean tongue and grooves of base and wall sections, prime and apply joint sealer prior to setting in place. Ensure that joint has fully seated. Use approved flexible joint sealant and same manufacturer's primer. The height of the lowest wall section shall be at least three (3) times the inside diameter of the largest sewer pipe entering the manhole and in no case less than 2-feet. Wall sections shall be plumb vertical.

G. Use eccentric cone top section for manholes greater than 6-feet deep. Use extension rings in accordance with the standard detail.

H. Frame and covers shall be installed so that the cover is exposed and flush with the existing surface. In no case will pavement be raised or lowered to meet the grade of installed manhole frames and covers. Where manholes are installed in sloping areas, the grade of the slope shall intersect the top rim of the cover on the uphill side. Manhole frame shall be sealed to the concrete manhole section with a bed of non-shrink grout on either side of bead of flexible joint sealant. In addition, the frame and cover shall be grouted to the outside of the concrete manhole section.

I. Manhole installations with tilted or otherwise defective bases, wall sections which are not plumb, covers which do not match existing grade properly, or are otherwise not in specification compliance shall be removed by the Contractor and replaced until acceptable.

3.02 MANHOLE VACUUM TESTING

A. Precast concrete manholes shall be tested in accordance with the following procedure. Manhole installations which fail the testing shall be repaired or replaced until passing results are obtained. If flexible joint sealant is pulled out during testing, it shall be repaired. No payment to the Contractor will be made for such repair and/or replacement.

B. Testing shall be done in the presence of the Engineer. Notify Engineer at least 2 working days in advance.

C. All manholes shall be tested for acceptance after the trench has been backfilled, compaction requirements have been met, road base rock has been installed, paving is complete, and concrete manhole collars have been installed. If manhole has passed test and the castings have later been disturbed, manhole shall be re-tested.

D. Thoroughly clean all manholes prior to testing. Remove all debris and do not allow foreign material to enter downstream piping.

E. Contractor shall provide all necessary equipment and personnel to conduct the testing, including vacuum equipment and indicating devices.

F. Procedure:

1. Plug all pipes entering manhole. Secure all plugs to prevent movement while vacuum is being drawn.

2. Testing shall include the joint between the manhole cone or riser ring(s) and the manhole cover frame.

3. Installation and operation of vacuum equipment and indicating devices shall be in accordance with the manufacturer's specifications and instructions.

4. Withdraw air from the manhole until a measured vacuum of 10-inches of mercury (10" Hg) is established in the manhole interior.

5. Record the time it takes for the vacuum to drop to 9-inches of mercury (9" Hg). Acceptance standards are based on this 1-inch of mercury change in negative pressure. Time measured for the 1" Hg pressure change shall be equal to or greater than the values in the following table:

Vacuum Testing Requirements (minimum test times, seconds)

Manhole Depth (ft)	Manhole Diameter (in)				
	42"	48"	54"	60"	72"
8' or less	17	20	23	26	33
10	21	25	29	33	41
12	25	30	35	39	49
14	30	35	41	46	57
16	34	40	46	52	67
18	38	45	52	59	73
20	42	50	53	65	81
22	46	55	64	72	89

6. Hydrostatic testing of manholes may be allowed. Test shall be in accordance with ASTM C497 as modified here. Test will consist of plugging all inlets and outlets and filling the manhole with water to the rim. Leakage in each manhole shall not exceed 0.2 gallons per hour per foot of head above the invert. Leakage will be determined by refilling to the rim using a calibrated or known volume container. Testing duration shall be at least 2 hours. Testing results shall be recorded on a form approved by the Engineer.

3.03 MODIFY EXISTING MANHOLE BASE

A. Modify or reconstruct manhole bases as required by hand forming channels with non-shrink grout to provide smooth flow surfaces from all inlets to the outlet. Non-shrink grout shall be as specified.

B. All flow channels shall be constructed with a minimum depth of three-fourths (¾) the contributing pipe diameter. Inverts shall be true to line and grade with flow lines having a minimum drop of 0.2 feet from inlet to outlet.

C. Shape flow channels to conform to connecting pipe surfaces. Ledges or benches shall be sloped towards channel to drain.

D. Remove all rough sections or sharp edges that might obstruct flow or cause snags.

E. Form base channels in conformance with the standard detail drawings.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Manholes and Appurtenances shall be included within the lump sum basis for the amount stated on the Bid Form.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for New Manholes, standard twelve (12) foot depth, will be made on a unit price basis per each, at the price stated in the Proposal. Payment will include all materials and labor required for complete installation, including excavation and backfill around manholes, all precast components, grouting and shaping of base channels, pipe adapters, testing, temporary hard surfacing, and all else related to this item not paid under other sections.

2. Manholes greater than twelve (12) feet in depth shall be paid additionally for each foot of depth over twelve (12) feet.

3. Depth measurements for payment of extra depth of manholes shall be made from the lowest invert pipe elevation to the rim of the manhole at finished grade. Measurement for payment shall be made to the nearest tenth of a foot for each additional foot of depth greater than twelve (12) feet.

4. Payment for Outside Drop Manhole Connections shall be made on a unit price basis per each at the price stated on the Bid Form. Payment shall include all materials, labor and equipment required for complete installation, including but not limited to, excavation and backfill, pipe adapters, fittings, grout, slurry backfill, and temporary hard surfacing.

5. Payment for Modify Existing Manhole Base shall be made on a unit price per each at the price stated on the Bid Form. Payment shall include all materials, labor and equipment required for a complete modification or reconstruction.

6. Payment for Manhole Connections shall be as defined in Section 02530 – Gravity Sewer Pipe & Fittings.

END OF SECTION

SECTION 02536 – PRECAST CONCRETE WETWELL

PART 1 GENERAL

1.01 SUMMARY

A. Section includes precast wetwell walls, bases, frames, cover and related appurtenances.

B. Wetwell materials shall be formed, manufactured and pretested at the factory site. Finished components shall be assembled, sealed at the work location by the Contractor

C. Wetwell sections shall be cast according to Engineer's drawings. Contractor shall make field measurements prior to casting to verify drawings and notify Engineer of any changes required by connections, elevations, mechanical piping, or any other approved appurtenances included as part of the submittals.

1.02 RELATED SECTIONS

A. Section 02535 – Manhole and Appurtenances

B. Section 03110 – Structural Cast-In-Place Concrete Forms

C. Section 03200 – Concrete Reinforcement

1.03 REFERENCES

A. American Standards for Testing and Materials (ASTM), latest edition
   1. ASTM A615 – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
   2. ASTM C923 – Resilient Connectors Between Reinforced Concrete Vault Structures and Pipe

B. American Concrete Institute (ACI), latest edition
   1. ACI – 318 – Building Code Requirements for Structural Concrete
   2. ACI – C478 – Precast Reinforced Concrete Manhole Sections

C. Uniform Building Code (UBC) – As amended to the "Oregon Structural Specialty Code" by the Oregon Building Codes Division, year 2008 amendments.

D. Association of State Highway and Transportation Officials (AASHTO), latest edition
   1. AASHTO H-20
   2. AASHTO M-198 – Joints for Circular Concrete Sewers and Culvert Pipe Using Flexible Watertight Gaskets

1.04 SUBMITTALS

A. Manufacturer literature showing all plan and elevation views including all dimensions, reinforcing placement and concrete shall be submitted to the Engineer prior to manufacture.

B. Structural design calculations showing conformance with ACI C478 of walls, base and cover after final shop drawings are coordinated with manufacturers of pump, access hatch and various cover penetrations.

1.05 QUALITY ASSURANCE

A. Precast well manufacturer shall have a minimum of five (5) years of successful experience in the design and assembly of prefabricated concrete structures.

B. Wetwell manufacturer shall guarantee all precast members against defective materials and workmanship for a period of 5 years after the date of project completion. If any materials or workmanship prove to be defective within the guarantee period, they shall be repaired or replaced by the manufacturer at no additional cost to owner.

C. Wetwell manufacturer conduct concrete strength tests on four by eight inch test cylinders from the same concrete batch used for the precast sections. Two tests for each daily mix batch shall be provided, one at 7 day cure and one at 28 day cure. Tests shall be provided to Engineer.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be cured and stored in a moist condition for a minimum of 14 days.

B. Materials shall be transported in such a manner to prevent damaging stresses and cracks.

C. Damaged, chipped, or cracked materials shall be repaired and patched to the satisfaction of the Engineer. If the materials cannot be satisfactorily repaired they must be replaced at no-cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete
1. Minimum compressive strength of 4000psi at 28 days.
2. Type II acid resistant cement conforming to ASTM C150.
3. Cover over reinforcing steel, 1" minimum.

B. Walls
1. Walls shall be minimum of 8" thick
2. Tongue and grooved joints with spacing such that pipes piping shall not pass through joints

C. Base
1. Minimum thickness shall be 12"
2. Extend a minimum of 12" beyond walls in all directions

D. Cover
1. Overall dimensions shall conform to those shown in drawings
2. Minimum thickness shall be 12".
3. Overall reinforcement and around penetrations shall be according to AASHTO H-20 Truck loading.

E. Reinforcement
1. Steel shall be ASTM A615 Grade 60.
2. Area of reinforcement shall be according to ACI C478 or as shown in drawings, whichever is more stringent.
3. No steps shall be provided
4. Thickness shall be a minimum of ½" #4 rebar

F. Joints
1. Joints shall be sealed with butyl rubber sealant rope which meets or exceeds AASHTO M-198
2. Exterior joint sealant applied in the form of an adhesive wrap. Exterior joint sealant shall be installed according to manufacturer's instructions including any concrete surface preparation required. EZ-Wrap Butyl Exterior Joint Wrap or approved equal.

G. Connections
1. Connections between walls and ductile iron pipe shall be made using a seal constructed of EPDM rubber links and providing a complete seal between the annular space between the pipe and wall opening. Installation hardware shall be made 316 stainless steel. Manufacturer; Press Seal, Link Seal or approved equal.
2. Gravity connections shall be precast into walls and be formed using an appropriately sized KOR-N-SEAL boot on each pipe and apply non-shrink grout to remainder of wall penetration to provide positive seal.
3. Inside drops shall be as specified in Section 15125.

H. Grout
1. A grout fillet shall be constructed around the circumference of the wetwell bottom to direct solids to the pumps. The minimum slope shall be 1:1 and shall conform to the construction drawings.
2. Grout shall be either:
   i. Non-Shrink Grout. Grout shall be Sika 212, Euco N-S, Five Star, or approved equal nonmetallic cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Nonshrink grout shall be placed and packed only with the use of an approved commercial bonding agent. Unused grout shall be discarded after 20 minutes
   ii. Or 4000 psi Type II concrete mix with a maximum aggregate size of 3/8".

I. Anchors
1. Anchors for pumps shall meet requirements of pump manufacturer. Anchors shall be wedge type, drilled and epoxied into wetwell base prior to pump installation. Anchors, nuts and washers shall be type 316 stainless steel.
2. Minimum size shall be ¾" diameter and embedded a to a minimum depth of 8".

J. Covers
1. Hatch cover shall be H20 rated as specified in Section 08305.

K. Vents
1. Wetwell shall be provided with an atmospheric vent as shown in drawing. Vent shall be 8" diameter and screened with a stainless steel screen.
2. Vents shall be made of stainless steel and welded joints. Vents shall be constructed in a "gooseneck" inverted style.

L. Suction Tube
1. Provide penetration in cover for Vacuum suction tube.
2. Vacuum tube shall utilize the sloped wetwell floor with a tapered vacuum head suction head connected to a vertical pipe and resting on the wetwell floor. Vertical pipe shall be constructed from stainless pipe or HDPE pipe capable of resisting vacuum without collapse.
3. Suction tube shall have cam-lock style fitting with cap, capable of connecting to City cleaning trucks. Coordinate fitting style with City.

4. Suction tube shall be Taylor EZZ Klean as manufactured by Taylor Site Development; or approved equal.

2.02 ACCESSORIES

A. Provide all Accessories necessary for proper placement, spacing, installation.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that ground surface is excavated to a minimum of 12" beyond the limits of the wetwell.

B. The wetwell shall be supported by a minimum of 12" of compacted crushed aggregate. Crushed stone must be level and to the limits shown in the Contract drawings. If further stabilization material is required or greater aggregate depth needed than Contractor shall provide material to depth required.

3.02 PLACEMENT

A. Material sections shall be placed one at a time using lifting hooks cast into the sections.

B. Tolerances shall be
1. ¼" from Plumb
2. ¼" from Level
3. No offsets greater than ¼" at any joint.

C. Install rubber rope sealant and adhesive wrap between sections, taking care to keep joints clean and to make a tight and complete seal.

D. Repair all nicks, chips, depressions and any voids left by removal of lifting devices to satisfaction of the Engineer.

E. Backfill in 6" lifts with Class B aggregate to drawing limits. Protect wetwall during compaction. Place wetwell cover last.

F. Vacuum test finished manhole.

3.03 VACUUM TESTING

A. Vacuum test wetwell in accordance with manhole procedure in Section 02535. Use tables in section to determine time and pressure drop. Vacuum testing shall be completed after backfill is complete and material has settled for a minimum of 30 days.

B. Plug all pipes entering precast sections and any required bracing to prevent plug blowouts.

C. If test fails Contractor shall locate leaks and make repairs with grouting material. Contractor shall continue to make repairs until test passes.

3.04 CLEANING

A. After successful completion of testing the wetwell shall be thoroughly cleaned of all silt and debris. After approval by Engineer proceed with the installation of wetwell mechanical components.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for precast wetwell shall be included as a portion of the lump sum or unit price costs for the associated items as stated in the Bid Form. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 02537 – MANHOLE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manhole rehabilitation shall include all work necessary to stop inflow and infiltration, repair voids, restore structural integrity, and provide protection against corrosion. Repair methods vary for each manhole as some require sealing rings, patching leaks or re-grouting.

1.02 REFERENCES

A. ASTM C 78 - Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading).
B. ASTM C 94 - Ready-Mixed Concrete.
C. ASTM C 109 - Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
D. ASTM C 234 - Comparing Concretes on the Basis of the Bond Developed with Reinforcing Steel.
E. ASTM C 267 - Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings.
F. ASTM C 321 - Bond Strength of Chemical-Resistant Mortars.
G. ASTM C 496 - Splitting Tensile Strength of Cylindrical Concrete Specimens.
H. ASTM C 596 - Drying Shrinkage of Mortar Containing Portland Cement.
I. ASTM C 666 - Resistance of Concrete to Rapid Freezing and Thawing.
J. ASTM C 827 - Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
K. ASTM C 952 - Bond Strength of Mortar to Masonry Units.
L. ASTM C 1244 - Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

1.03 SUBMITTALS

A. Comply with Section 01300 – Submittals.
B. Product Data: Submit manufacturer's product data, including physical properties, surface preparation, repair, application, curing, and field quality control.
C. Manufacturer Qualifications: Submit list of a minimum of 10 manhole rehabilitation projects completed during past 3 years.
D. Applicator Qualifications: Submit qualifications of applicator.

1. Certification stating applicator is factory trained and approved by manufacturer in application of the specified products.
2. List of recently completed manhole rehabilitation projects, including project name and location, names of owner and engineer, and description of products used, substrates, and application procedures.

1.04 QUALITY ASSURANCE

A. Material Qualifications: Minimum of five year history of being used for rehabilitation of sanitary system manholes.

B. Applicator Qualifications:

1. Factory trained and approved by manufacturer in application of the specified products.

2. Employs persons trained for the application of the specified products.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, manufacturer's stock number, color, and federal specification number.

B. Storage:

1. Store materials in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. Store materials in a cool dry environment.

C. Handling: Protect materials during handling and application to prevent damage.

1.06 ENVIRONMENTAL CONDITIONS

A. Do not apply materials if ambient temperature is below 40 degrees F.

B. Do not apply materials to frozen surfaces or if freezing is expected within substrate within 24 hours after application.

C. Keep mix temperature at time of application below 90 degrees F.

D. Do not exceed water temperature of 80 degrees F.

PART 2 PRODUCTS

2.01 MATERIALS

A. General:

1. Materials shall be from a single manufacturer.
2. Materials shall be compatible with substrate and with each other.
3. Materials shall be approved by manufacturer.

B. Void Filling Urethanes: Durable, rapid-setting, chemical resistant, expanding foam or gel designed for injection under active water infiltration conditions, forming strong bond to concrete, and curing to form resilient, flexible rubbery gasket.

1. Grout: Hydrophilic foam or gel
2. Minimum Tensile Strength, ASTM D 3574: 80 psi
3. Minimum Bonding Strength: 250 psi
4. Elongation, ASTM D 3574: 250% minimum
5. Corrosiveness: Noncorrosive
6. Toxicity: Nontoxic
7. Avanti AV-330 Safeguard; 3M Scotch-Seal 5600; Strata Tech ST-500 series; Deneef Hydro Active Flex LV; Concresive 1200 series; or approved equal.

C. Reinforced cementitious mortar: Fiber-reinforced, spray-applied, cementitious mortar to fill minor cracks and surface imperfections. Used to surface repair of manhole.

1. Minimum Compressive Strength, ASTM C 109: 8,000 psi at 28 days.

2. Minimum Tensile Strength, ASTM C 496: 500 psi at 28 days.
3. Minimum Flexural Strength, ASTM C 78: 1,000 psi at 28 days.
4. Shrinkage, ASTM C 596: 0 percent at 28 days, 90 percent relative humidity.
5. Minimum Bond, ASTM C 952: 2000 psi at 28 days.
6. Applied Density: 150 plus or minus 5 pounds per cubic foot.
7. Freeze/Thaw Resistance, ASTM C 666, Method A: 100 cycles, no visible damage.
8. Factory Blended: Requires only addition of water at site.
9. Fiber Reinforcement: silica, acrylic fiber, or alkaline-resistant fiberglass rods.
10. Strong-Seal High Performance Mix; Thoroc SP15 Spray Mortar, Emaco S88; or approved equal.

D. Epoxy finish coats: sulfide resistant epoxy mortars, troweled or sprayed onto concrete or mortar surface. Forms a permanent bonded liner to entire surface.
1. Minimum Tensile Strength, ASTM D 638 3,000 psi
2. Minimum Flexural Strength ASTM D 790 4,300 psi
3. Adhesion ASTM D 4541 350 psi
4. Hardness ASTM D 2240 Shore D 70
5. Coating thickness 60 mils
6. Raven 405; Strong Seal Epoxy; Sewer Guard HBS 100, or approved equal.

E. Water: Clean and potable. Test nonpotable water in accordance with ASTM C 94.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive manhole coatings. Notify the Engineer in writing if surfaces are not acceptable. Do not begin surface preparation, repair, or application until unacceptable conditions have been corrected.

3.02 SURFACE PREPARATION

A. Prepare surfaces in accordance with manufacturer's instructions.

B. Protection: Place covers over invert to prevent extraneous material from entering sewer lines.

C. Cleaning: Clean manhole walls and bench by using a minimum of 1,500 psi water spray to remove contaminants, dirt, debris, and other foreign materials.

D. Remove loose, unsound, and protruding brick, mortar, and concrete.

E. Inspection by Engineer: Before application of each material, surfaces to be sprayed or coated will be inspected by the Engineer. Correct defects or deficiencies identified by the Engineer before application of subsequent material.

3.03 MANHOLE COATING

A. Manholes listed for coating shall be the designated discharge location for the new pump station. Materials shall be as specified in section 2.01. Alternate materials or methods shall be as approved by the Engineer.

B. Voids: Repair and fill voids greater than 2 inches in depth with urethane patching materials. Apply patching material in accordance with manufacturer's instructions.

C. Active Leaks:

1. Stop active leaks with patching material or infiltration control material. Apply material in accordance with manufacturer's instructions.
2. Install weep holes as required to localize infiltration during application of patching material or infiltration control material.
3. Plug weep holes after application with infiltration control material before application of liner material.
4. Severe Infiltration: Drill as required to permit foam or sealant injection. Apply repair compound in accordance with manufacturer's instructions.

D. Advance Notice: Give the Engineer a minimum of 2 days advance notice of start of application.

3.04 INVERT REPAIR

A. Remove loose and unsound materials and wash walls, after surface preparation is complete.

B. Repair bench, invert, or service line using patching material. Apply in accordance with manufacturer's instructions.

C. Repair inverts with visible damage, where infiltration is present, or when vacuum testing is specified.

D. Apply patching material to invert, after blocking flow through manhole and thoroughly cleaning invert.

E. Uniformly trowel patching material onto damaged invert at a minimum thickness of 1/2 inch at invert. Extend out onto bench of manhole sufficiently to tie into liner material.

F. Ensure finished invert surfaces are smooth and free of ridges.

G. Reestablish flow in manhole after a minimum of 30 minutes after application of patching material.

3.05 APPLICATION OF LINER MATERIAL

A. Apply cementitious reinforced liner over entire manhole prior to epoxy coat for existing manholes. For new manhole no coat is required.

B. Equipment: Spray apply liner material using approved equipment designed and manufactured by material manufacturer for the specific application.

C. Mixing:

1. Mix liner material with water in accordance with manufacturer's instructions.
2. Discharge prepared mix into hopper.
3. Continue mixing as liner material is continuously sprayed.

D. Cleaning: Ensure surface is clean and free of foreign material.

E. Saturated Surface: Ensure surface is damp and totally saturated with water without noticeable free water droplets or running water, just before application of liner material. Brick surfaces should be allowed to drain for 2 hours before coating.

F. Spraying: Spray apply liner material in 1 or more passes from bottom of wall to bottom of frame to form a structurally enhanced monolithic liner.

1. Minimum Total Thickness: 1/2 inch.

G. Finishing:

1. Trowel surface of sprayed liner material to relatively smooth finish. Do not over trowel.
2. Apply brush finish to trowel finished surface.

H. Follow manufacturer's instructions whenever more than 24 hours have elapsed between applications.

3.06 CURING

A. Cure materials in accordance with manufacturer's instructions.

B. Exposure:

1. Minimize exposure of applied materials to sunlight and air movement.
2. Cover structure if time between application of additional coats is to be longer than 15 minutes.
3. Do not expose finished materials to sunlight or air movement for longer than 15 minutes before covering or closing access.
4. Shade manhole while rehabilitation is in process in hot and arid climates.

C. Concrete Curing Compound:

1. Apply concrete curing compound if relative humidity is less than 70 percent within manhole.
2. Apply curing compound in accordance with manufacturer's instructions.

D. Cure Time: Allow a minimum of four (4) hours cure time before subjecting manholes to flows.

3.07 APPLICATION OF EPOXY COATING

A. Apply a continuous coat of epoxy of entire surface of manhole and under rim sealing all joints, bench and pipe penetrations.

B. Apply in accordance with all manufacturer instructions including priming or surface preparation.

C. Measure ph of surface before application to conform to manufacturer requirements

D. Spray or trowel in an even coat maintaining a monolithic liner.

E. Utilize a mil thickness gage during application to ensure an even depth of material and prevent voids from forming.

F. Apply a broadcast of fine dried sand over bench surface to provide footing before epoxy is cured and remains "tacky".

G. Allow finished product to set for at least 24 hours before visual inspection. Flows may resume after 4-8 hours.

3.08 FIELD QUALITY CONTROL

A. Inspection by the Engineer or the waiver of inspection of any portion of the work shall not relieve the Contractor of responsibility to perform the work as specified.

B. Leaks: Visually verify absence of leaks.

C. Vacuum Test: Perform vacuum test in accordance with Section 02535 – 3.03 of these Specifications. Vacuum test shall not be performed earlier than 7 days after application.

3.09 PROTECTION

A. Do not allow traffic for a minimum of 24 hours after final application of liner material.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Manhole Coatings will be made on a unit price basis per each, at the price stated on the Bid Form. Payment will include all materials and labor required for complete rehabilitation, including invert repair, liner construction, testing, and all else related to this item not paid under other sections.

END OF SECTION

SECTION 02740 – ASPHALT CONCRETE PAVEMENT

PART 1 GENERAL

1.01 SUMMARY

A. This section includes furnishing all materials, labor and equipment necessary to construct asphalt concrete pavement to the lines, grades and cross sections shown or established, including one or more courses and overlays. Work shall be performed in conformance with any applicable State, County or District Standards.

PART 2 PRODUCTS

2.01 DEFINITIONS

A. Hot Mixed Asphalt Concrete (HMAC) – Asphalt concrete is a hot mix of asphaltic cement; well graded, high quality aggregate; mineral filler and additives, as required; plant mixed into a uniformly coated mass, hot laid in on a prepared foundation, and compacted to a specified density.

B. ODOT Standard Specifications – The 2002 Oregon Department of Transportation/APWA Oregon Chapter Standard Specifications for Construction.

2.02 MATERIALS

A. Coarse and fine aggregate shall conform to the qualification requirements of Section 00745.10 of the ODOT Standard Specifications, latest edition.

B. Asphalt Cement – HMAC shall use PBA-2 grade asphalt cement.

C. HMAC shall be ½" Dense Graded Mix, in accordance with Section 00745 of the ODOT Standard Specifications

D. Asphalt Tack Coat shall consist of CSS-1 or CSS-1h emulsified asphalt (EA) conforming to ODOT Standard Specifications, Section 00730.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Unless otherwise specified herein, HMAC shall be mixed, processed, hauled, laid, compacted and finished in accordance with Section 00745 of the ODOT Standard Specifications, latest edition.

B. Notify the Engineer at least 48-hours prior to placement of base aggregate and asphalt concrete pavement to permit inspection.

C. When, in the judgment of the Engineer, the weather is such that satisfactory results cannot be achieved asphalt concrete paving operations shall be suspended. Owner shall not be liable for damages or claims of any kind or description due to the suspension of operations by the Engineer. HMAC shall not be placed when the ambient temperature is below 35° F.

D. Adhere to all applicable State and/or OSHA regulations pertaining to road closure, traffic control, and other related safety precautions.

E. To provide for the convenience and safety of the traveling public, pavement replacement shall be performed immediately following the completion of backfilling operations. In the event that pavement replacement cannot be performed as such, the Contractor shall maintain the trench backfill on a daily basis, as directed, until pavement replacement has been completed.

F. Subgrade and aggregate base shall be prepared, compacted and finished in accordance with Section 02720.

G. Pavement Sawcutting

1. Utility trenches in existing pavement areas shall be sawcut immediately prior to repaving. Sawcuts shall be made a minimum of 6-inches outside the limits of the trench, or to the outer extents of pavement damaged as a result of the Contractor's operations, whichever is greater.

H. Tack Coat Asphalt

1. Contact surfaces of manholes, catch basins, gutters and existing pavements shall be treated with a layer of tack coat asphalt. Do not place on wet surfaces.

2. Joints between existing and new AC pavement shall be filled with tack coat asphalt.

3. Apply tack coat asphalt with a pressure distributor capable of uniformly applying the emulsified asphalt at even heat on variable surface widths up to 16-feet, at readily determined and controlled rates from 0.05 to 0.20 gallons per square yard, and with uniform pressure. Pressure distributor shall include a tachometer, pressure gages, accurate volume measuring devices and a thermometer for measuring temperature of tank contents. Pressure distributor shall be equipped with a positive power asphalt pump and full circulation spray bars adjustable both laterally and vertically. Set bar height for triple lap coverage.

4. Minimum surface temperature at the time of placement of tack coat asphalt shall not be less than 50° F.

5. Tack coat shall only be applied to clean dry surfaces. All loose material should be removed by sweeping, flushing with water or other approved methods.

6. Apply tack coat asphalt at the following rates for the indicated surfaces.

Surface	Application Rate (gallons / yd^2)	
	Undiluted	Diluted 1:1 with Water
New HMAC	0.05 – 0.07	0.10 – 0.13
Oxidized HMAC	0.07 – 0.10	0.13 – 0.20
Milled HMAC	0.10 – 0.13	0.20+

7. Tack coat asphalt shall be at a temperature between 140° F and 185° F as recommended by the manufacturer at the time of application.

8. Do not place HMAC on the tack coat until the asphalt separates from the water, but before it loses its tackiness.

I. Asphalt Concrete Pavement

1. HMAC shall be a minimum of 250° F at the time of placement.

2. Storage of HMAC in silos shall not be permitted.

3. Control of line and grade shall be manual.

4. HMAC shall be covered during hauling if rain or cold air temperatures are encountered any time between loading and placement. HMAC will be rejected if any of the following is observed: mix falls below minimum specified temperature; slumping or separating; solidifying or crusting; absorbing moisture. Rejected loads shall be disposed of at the Contractor's expense.

5. Deposit HMAC from the hauling vehicles so segregation is prevented. HMAC shall not be windrowed.

6. Placement

   a. HMAC should be placed using a self-contained, self-propelled paver supported on tracks or wheels that do not contact the mix being placed.

   b. When leveling irregular surfaces and raising low areas, do not exceed 2-inches actual compacted thickness on any one lift.

   c. Place the mix in the number of lifts and courses, and to the compacted thickness for each lift and course as shown on the Plans. Limit the minimum lift thickness to twice the maximum aggregate size in the mix.

7. The compacted depth of new asphalt concrete pavement on public streets shall be 2-inches, minimum. Asphalt concrete paving for utility trench patches shall be 2-inches, minimum, or shall match the existing paving, whichever is greater. Asphalt concrete overlays on public streets shall have a minimum thickness of 2-inches. On non-public roads or driveways, match existing thickness, with a minimum thickness of 2-inches. Asphalt concrete pavement in excess of 2-inches thick shall be constructed in multiple lifts of approximately equal thickness. The maximum compacted thickness of any individual lift shall not exceed 2-inches.

8. Pavement shall be placed, shaped, compacted and finished to the grades and cross sections shown on the Plans or established. Taper new overlays at limits to match existing asphalt pavement.

9. HMAC shall be compacted using self-propelled steel wheeled static rollers, vibratory rollers, or pneumatic tired rollers capable of achieving the minimum compaction specified. If vibratory rollers are used, they should be specifically designed for compaction of HMAC, have adjustable amplitude and frequency, and be capable of at least 2000 vibrations per minute. Finish rolling should be performed by a static roller or a vibratory roller in the static mode.

10. Asphalt concrete pavement shall be compacted to a minimum of 92% relative compaction with the theoretical maximum density determined by AASHTO T-209. Testing shall be performed at random locations using a nuclear gauge operated in the back-scatter mode. At least one density test shall be performed every 1000 lineal feet on each spread or a minimum of one test each day of production.

J. No traffic shall come in contact with any newly paved surface until surface has cooled and set sufficiently to prevent marking. The Contractor is responsible for traffic control.

K. Warranty

1. Contractor shall maintain all asphalt concrete paved areas and shall furnish all required materials and workmanship at no additional cost to the Owner for a period of one year following the Owner's acceptance of the complete project.

2. If any newly paved asphalt concrete surfaces settles, cracks, breaks, or becomes otherwise defective within the warranty period as described herein, then the deficiencies or damages in surfacing shall be immediately repaired by the Contractor upon request and in a manner approved by the Engineer.

3. All costs incurred in the repair of deficiencies or damages shall be borne by the Contractor, with no additional compensation allowed.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT – SCHEDULE I PUMP STATION NO. 4 REPLACEMENT

A. Payment for Asphalt Concrete Pavement shall be included within the lump sum basis for the amount stated on the Bid Form.

4.02 MEASUREMENT AND PAYMENT – SCHEDULE II SEWER PIPE AND FORCEMAIN

B. Measurement and payment for the excavation, disposal, backfill, and other preparation of trenches is included within the lineal foot cost for Trench Excavation, Bedding & Backfill.

C. Utility Trenches – Class "B" backfill or CLSM backfill shall be brought to the surface and used as Aggregate Base. No separate measurement and payment will be made for Aggregate Base.

D. Sawcutting – The cost for sawcutting existing pavement adjacent to new utility trenches shall be considered incidental to the work. No additional compensation will be allowed for sawcutting.

E. Asphalt Concrete Pavement

1. Measurement and payment for Asphalt Concrete Pavement shall be made on a tonnage basis, at the unit price stated on the Bid Form. Payment shall include full compensation for all work necessary to prepare and construct the asphalt concrete pavement. There will be no separate measurement of bituminous cements or additives contained in the mixture or used otherwise in the work. Payment will be made only for material incorporated into the specified limits.

   a. Asphalt Concrete Pavement for utility trenches shall be paid on a tonnage basis, at the unit price stated on the Bid Form. The limits of the trench patching shall be as established herein, including sawcuts. Additional costs for repair of pavement damaged by the Contractor outside the trench and sawcut limits as described herein shall be borne by the Contractor.

2. A separate ticket shall accompany each load delivered to the job site and shall be given to the Engineer before the load is spread. No ticket will be accepted unless it shows the date, ticket number, driver's name, project name, batch number, truck weight, gross weight and tonnage of asphalt.

3. All trucks shall be weighed at least once each day while unloaded and weighed while loaded for each trip. Platform scales furnished by the Contractor shall be tested and certified.

END OF SECTION

SECTION 02820 – FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section includes all labor, materials and equipment necessary to furnish and install chain link fencing and gates as shown on plans.

B. Section includes all labor, materials and equipment necessary to furnish and install cedar wood fence as shown on plans.

1.02 SUBMITTALS

A. Submittals shall meet the requirements of Section 01300. Submittals shall include material specifications indicating materials, dimensions and finish.

PART 2 PRODUCTS

2.01 CHAIN LINK FABRIC, TIES AND TENSION WIRE.

A. Chain link fabric, ties and tension wire shall conform to the requirements of AASHTO M 181 as supplemented and modified by this Specification.

B. Materials for chain link fencing shall be standard commercial products which meet the general requirements of these Specifications.

C. Fabric may be zinc-coated steel meeting Type I, Class D coating requirement, or aluminum-coated steel. Aluminum-coated steel shall be coated with at least 0.40 ounce per square foot. Use only one type on Project.

D. Wire fabric ties, wire ties, and hog rings shall be zinc-coated steel wire. Tension wire shall be # 7 gauge spring wire and have a Class 2 coating. Number 9 gauge galvanized ties or clips shall be provided for attaching tension wires to the fabric.

E. Chain link fence fabric shall be # 9 gauge wire woven in a 2 inch mesh. Fabric shall be the height indicated on the Plans with both edges selveaged, twisted and barbed. Coating shall be applied after fabrication.

F. Line posts shall be round tubular steel having a nominal outside diameter of 2 3/8 inches.

G. End, corner, pull posts and intermediate posts shall be round tubular steel having a nominal outside diameter of 2 7/8 inches.

H. Top rail and post braces shall be round having a nominal outside diameter of 1 5/8 inches.

I. Top of fence shall be terminated with 3 strands of 12.5 gauge barbed security wire.

J. Stretcher bars shall not be less than ¼" x ¾" x length required. Length shall be 1 inch less than the height of the specified fabric. Stretcher bars shall be provided for stretching and securing the fabric at each gate, end, corner and pull post, one for each gate and end post and two for each corner and pull post.

2.02 POST TOPS

A. All posts shall be provided with post tops which will fit over the outside of posts to preclude moisture entry. Caps shall be pressed steel or malleable iron, galvanized.

2.03 POST BRACES

A. A horizontal, galvanized post brace shall extend to each adjacent line post at mid-height of the fabric for each gate, corner, pull and end post.

B. A diagonal ½" diameter truss rod shall also be provided from the line post to the gate, corner, pull, or end post, with a turnbuckle or other equivalent device for tension adjustment. Two diagonal tension truss rods shall be provided for each fence panel adjacent to a gate, end, corner or pull post.

2.04 FENCE GATES

A. Fabric gates used with chain link fence shall be chain link of the same gauge and conforming to applicable requirements of these Specifications. Install stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" O. C.

B. Gate shall be rolling gate as shown on plans.

C. Gate frames shall be fabricated from minimum 1 5/8" diameter steel tubing to match fence framework. Assemble gate frames by welding, or with special fittings and rivets for rigid connections. Provide horizontal and diagonal members as necessary to ensure rigidity and proper gate operation.

D. Install diagonal cross-bracing consisting of 1/2" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.

E. Gate Hardware as follows:

a. Provide manufacturer's standard solid rubber-tired rollers for ground supported sliding gates. Include intermediate rollers or casters where required to prevent sag or deflection. Gate shall have top and bottom rear rollers on minimum 1 5/8" diameter tracks. Provide padlockable latch on rolling gate.

2.05 WOOD FENCE

A. Slats shall be #1 grade redwood or cedar. Full cut 1"x4" and 1"x6" dog-ear slats.

B. Top, middle and bottom rails shall be minimum 2"x4" cedar studs 8 feet long. Minimum 3 rails, minimum 6 nails per slat.

C. Corner, end and line posts shall be minimum 4"x4" cedar post. Set cedar posts in concrete minimum 24" deep. Extend concrete 4" above grade and slope concrete away from post to shed water.

D. Assemble with galvanized screw shank nails.

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not begin installation and erection before final surfacing and grading is completed.

3.02 POST INSTALLATION

A. Excavation: Auger or hand excavate with post-hole digger holes for posts to diameters and spacing indicated in these Specifications.

a. Excavate Holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times the largest cross-section of post.

b. Excavate hole depths 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.

B. Fence Post Setting

a. Line posts shall be placed equidistant at intervals not to exceed 10 feet O.C. The intervals to be measured parallel to the grade of proposed fence and in the line of the fence.

b. Posts shall be set vertically and plumb and encased in cylindrical concrete footings at least 4 times the post diameter, with at least 2" cover on the bottom of the post. Extend the concrete at least 2" above grade and crown to shed water.

C. Rail Installation

a. Connect top rail securely to the posts using boulevard clamps or other suitable means, such that a continuous brace is formed.

D. Chain Link Fabric

a. Chain link fence fabric shall be installed over the outside of the fence framework. Fabric shall be tied to the line posts with # 9 gauge galvanized steel wire spaced at 12-inches maximum.

E. Tension Wires

a. Install tension wires along bottom of fence before stretching fabric and tie to each post. Fasten fabric to tension wire using # 9 gauge wire ties or galvanized steel hog rings spaced at 24" O.C.

F. Gates

a. Install gates plumb, level and secure for full opening without interference. Adjust hardware for smooth operation and lubricate.

G. Stretcher Bars

a. Thread through or clamp to fabric 4" O.C. and secure to posts with metal bands spaced 15" O.C.

H. Brace Assemblies

a. Install braces so posts are plumb when diagonal rod is under proper tension.

3.03 WOOD FENCE INSTALLATION

A. Cedar posts shall be set true to line and grade in concrete bases at least 24 inches in depth. All posts shall be sound and fee from decay, splits, cracks or other defect that would weaken the posts or shorten the expected life of the post.

B. Distance between posts shall not exceed 8 feet.

C. Rails shall be securely fastened to posts with galvanized screw shank nails or galvanized screws.

D. Changes in direction in excess of 20 degrees shall be considered corners and treated as such.

E. A minimum of 6 inches of concrete shall be provided below each post. A minimum of 4 inches of concrete shall be provided around the post above grade. Slope concrete away from post to shed water away from post. End posts and line posts shall have concrete base at least 12 inches in diameter.

F. Fence slats shall face away from the fenced property, i.e. toward the road and neighboring property. Slats shall be placed approximately 2 inches above grade and on straight grade between posts. Slats shall be free from decay or defects that would weaken the slat, reduce its effective life or adversely affect the intended use of the slat. Slats shall be attached with two galvanized screw shank nails into each rail, 6 nails per slat.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for Fences and Gates in the Section shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. No separate measurement or payment will be made for these quantities and items.

END OF SECTION

SECTION 02830 – MODULAR RETAINING WALLS

PART 1 GENERAL

1.01 DESCRIPTION

A. Work shall consist of furnishing and construction of a Keystone Standard, Keystone Compac System, Tensar Mesa; or equal in accordance with these specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown on the plans.

B. Work includes preparing foundation soil, furnishing and installing leveling pad, unit drainage fill and backfill to the lines and grades shown on the construction drawings section includes all labor, materials and equipment necessary to furnish and install cedar wood fence as shown on plans.

C. Work includes furnishing and installing geogrid soil reinforcement of the type, size, location, and lengths designated on the construction drawings.

1.02 Related Sections

A. Section 02250 Demolition and Site Preparation

1.03 Reference Documents

A. American Society for Testing and Materials (ASTM)

1. ASTM C1372 Specification for Dry-Cast Segmental Retaining Wall Units
2. ASTM D422 Particle-Size Analysis of Soils
3. ASTM D698 Laboratory Compaction Characteristics of Soil -Standard Effort
4. ASTM D4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
5. ASTM D4595 Tensile Properties of Geotextiles - Wide Width Strip
6. ASTM D5262 Unconfined Tension Creep Behavior of Geosynthetics
7. ASTM D6637 Tensile Properties of Geogrids – Single or Multi-Rib
8. ASTM D6638 Connection Strength - Reinforcement/Segmental Units
9. ASTM D6706 Geosynthetic Pullout Resistance in Soil

B. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M 252 Corrugated Polyethylene Drainage Pipe

C. Geosynthetic Research Institute (GRI)

1. GRI-GG4 Determination of Long Term Design Strength of Geogrids
2. GRI-GG5 Determination of Geogrid (soil) Pullout

D. National Concrete Masonry Association (NCMA)

1. NCMA SRWU-1 Test Method for Determining Connection Strength of SRW
2. NCMA SRWU-2 Test Method for Determining Shear Strength of SRW

1.04 Submittals

A. Contractor shall submit a Manufacturer's certification, prior to start of work, that the retaining wall system components meet the requirements of this specification and the structure design.

B. Contractor shall submit construction drawings and design calculations for the retaining wall system prepared and stamped by a Professional Engineer registered in the state of the project. The engineering designs, techniques, and material evaluations shall be in accordance with the Manufacturer's Design Manual, NCMA Design Guidelines For Segmental Retaining Walls, or the AASHTO Standard Specifications for Highway Bridges (whichever is applicable to designer).

C. Contractor shall submit a test report documenting strength of specific modular concrete unit and geogrid reinforcement connection. The maximum design tensile load of the geogrid shall be equal to the laboratory tested ultimate strength of geogrid / facing unit connection at a maximum normal force limited by the "Hinge Height" of the structure divided by a safety factor of 1.5. The connection strength evaluation shall be performed in accordance with ASTM D6638 (NCMA SRWU-1).

1.05 Quality Assurance

A. Contractor shall submit certification, prior to start of work, that the retaining wall system (modular concrete units and specific geogrid):

1) Has been successfully utilized on a minimum of five (5) similar projects, i.e., height, soil fill types, erection tolerances, etc.; and

2) Has been successfully installed on a minimum of 1 million (1,000,000) square feet of retaining walls.

B. Owner shall/may provide soil testing and quality assurance inspection during earthwork and wall construction operations. Contractor shall provide any quality control testing or inspection not provided by the Owner. Owner's quality assurance program does not relieve the contractor of responsibility for quality control and wall performance.

1.06 Delivery, Storage and Handling

A. Contractor shall check all materials upon delivery to assure that the proper type, grade, color, and certification has been received.

B. Contractor shall protect all materials from damage due to jobsite conditions and in accordance with manufacturer's recommendations. Damaged materials shall not be incorporated into the work.

PART 2 PRODUCTS

2.01 Definitions

A. Modular Unit - a concrete retaining wall element machine made from Portland cement, water, and aggregates.

B. Structural Geogrid - a structural element formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth and function primarily as reinforcement.

B. Unit Drainage Fill - drainage aggregate, which is placed within and immediately behind the modular concrete units.

D. Reinforced Backfill - compacted soil, which is placed within the reinforced soil volume as outlined on the plans.

2.02 Modular Concrete Retaining Wall Units

A. Modular concrete units shall conform to the following architectural requirements:

1. Face color – Owner's Choice.
2. Face finish – Owner's Choice.
3. Bond configuration - running with bonds nominally located at midpoint vertically adjacent units, in both straight and curved alignments.
4. Exposed surfaces of units shall be free of chips, cracks or other imperfections when viewed from a distance of 10 feet under diffused lighting.

B. Modular concrete materials shall conform to the requirements of ASTM C1372 - Standard Specifications for Segmental Retaining Wall Units.

C. Modular concrete units shall conform to the following structural and geometric requirements measured in accordance with ASTM C140 Sampling and Testing Concrete Masonry Units:

1. Compressive strength: ≥ 3000 psi (21 MPa);
2. Absorption: 8 % (6% in northern states) for standard weight aggregates;
3. Dimensional tolerances: ± 1/8" (3 mm) from nominal unit dimensions not including rough split face, ±1/16" (1.5 mm) unit height - top and bottom planes;
4. Unit size: 8" (203 mm) (H) x 18" (457 mm)(W) x 18" (457 mm)(D) minimum;
5. Unit weight: 100 lbs/unit (45 kg) minimum for standard weight aggregates.

D. Modular concrete units shall conform to the following performance testing:

1. Inter -unit shear strength in accordance with ASTM D6916 (NCMA SRWU-2): 1500 plf (21 kN/m) minimum at 2 psi (13 MPa) normal pressure;
2. Geogrid/unit peak connection strength in accordance with ASTM D6638 (NCMA SRWU-1): 900 plf (13 kN/m) minimum at 2-psi (13 MPa) normal force.

E. Modular concrete units shall conform to the following constructability requirements:

1. Vertical setback: 1/8" (3 mm) ± per course (near vertical) or 1" (25 mm) + per course per the design;
2. Alignment and grid positioning mechanism - fiberglass pins, two per unit minimum;
3. Maximum horizontal gap between erected units shall be ≤ 1/2 inch (13 mm).

2.03 Shear Connectors

A. Shear connectors shall be 1/2-inch (12 mm) diameter thermoset isopthalic polyester resin-pultruded fiberglass reinforcement rods or equivalent to provide connection between vertically and horizontally adjacent units with the following requirements:

1. Flexural Strength in accordance with ASTM D4476: 128,000 psi (882 MPa) minimum;
2. Short Beam Shear in accordance with ASTM D4475: 6,400 psi (44 MPa) minimum.

B. Shear connectors shall be capable of holding the geogrid in the proper design position during grid pre-tensioning and backfilling.

2.04 Base Leveling Pad

A. Material shall consist of a compacted crushed stone base or non-reinforced concrete as shown on the construction drawings.

2.05 Unit Drainage Fill

A. Unit drainage fill shall consist of clean 1" (25 mm) minus crushed stone or crushed gravel meeting the following gradation tested in accordance with ASTM D-422:

Sieve Size	Percent Passing
1 inch (25 mm)	100
3/4-inch (19 mm)	75-100
No. 4	0 - 10
No. 50	0 - 5

C. One cubic foot (0.028 m3), minimum, of drainage fill shall be used for each square foot (0.093 m2) of wall face. Drainage fill shall be placed within cores of, between, and behind units to meet this requirement.

2.06 Reinforced Backfill

A. Reinforced backfill shall be free of debris and meet the following gradation tested in accordance with ASTM D-422:

Sieve Size	Percent Passing
2-inch (50 mm)	100
3/4-inch (19 mm)	100-75
No. 40	0-60
No. 200	0-35

Plasticity Index (PI) <15 and Liquid Limit <40 per ASTM D-4318.

B. The maximum aggregate size shall be limited to 3/4 inch (19 mm) unless field tests have been performed to evaluate potential strength reductions to the geogrid design due to damage during construction.

C. Material can be site-excavated soils where the above requirements can be met. Unsuitable soils for backfill (high plastic clays or organic soils) shall not be used in the backfill or in the reinforced soil mass.

D. Contractor shall submit reinforced fill sample and laboratory test results to the Engineer for approval prior to the use of any proposed reinforced fill material.

2.07 Geogrid Soil Reinforcement

A. Geosynthetic reinforcement shall consist of geogrids manufactured specifically for soil reinforcement applications and shall be manufactured from high tenacity polyester yarn or high-density polyethylene. Polyester geogrid shall be knitted from high tenacity polyester filament yarn with a molecular weight exceeding 25,000 Meg/m and a carboxyl end group values less than 30. Polyester geogrid shall be coated with an impregnated PVC coating that resists peeling, cracking, and stripping.

B. Ta, Long Term Allowable Tensile Design Load, of the geogrid material shall be determined as follows:

Ta = Tult / (RFcr*RFd*RFid*FS)
Ta shall be evaluated based on a 75-year design life.
Ta = 890 minimum.

1. Tult, Short Term Ultimate Tensile Strength shall be determined in accordance with ASTM D4595 or ASTM D6637.
Tult is based on the minimum average roll values (MARV). Tult = 3700 lbs/ft minimum.

2. RFcr, Reduction Factor for Long Term Tension Creep
RFcr shall be determined from 10,000-hour creep testing performed in accordance with ASTM D5262. Reduction value = 2.64 minimum.

3. RFd, Reduction Factor for Durability
RFd shall be determined from polymer specific durability testing covering the range of expected soil environments. RFd = 1.00 minimum.

4. RFid, Reduction Factor for Installation Damage
RFid shall be determined from product specific construction damage testing performed in accordance with ASTM D5818 (GRI-GG4). Test results shall be provided for each product to be used with project specific or more severe soil type. RFid = 1.05 minimum.

5. FS, Overall Design Factor of Safety
FS shall be 1.5 unless otherwise noted for the maximum allowable working stress calculation.

C. The maximum design tensile load of the geogrid shall not exceed the laboratory tested ultimate strength of the geogrid/facing unit connection as limited by the "Hinge Height" divided by a factor of safety of 1.5. The connection strength testing and computation procedures shall be in accordance with ASTM D6638 Connection Strength between Geosynthetic Reinforcement and Segmental Concrete Units (NCMA SRWU-1).

D. Soil Interaction Coefficient, Ci
Ci values shall be determined per ASTM D6706 (GRI:GG5) at a maximum 0.75-inch (19 mm) displacement.

E. Manufacturing Quality Control
The geogrid manufacturer shall have a manufacturing quality control program that includes QC testing by an independent laboratory.
The QC testing shall include:
Tensile Strength Testing
Melt Flow Index (HDPE)

Molecular Weight (Polyester)

2.08 Drainage Pipe

A. The drainage pipe shall be perforated or slotted PVC pipe manufactured in accordance with ASTM D-3034 or corrugated HDPE pipe manufactured in accordance with AASHTO M252.

2.09 Geotextile Filter Fabric

A. When required, Geotextile filter fabric shall be 4.0 oz/sy, polypropylene, needlepunched nonwoven fabric.

PART 3 EXECUTION

3.01 Excavation

A. Contractor shall excavate to the lines and grades shown on the construction drawings. Owner's representative shall inspect the excavation and approve prior to placement of leveling material or fill soils. Proof roll foundation area as directed to determine if remedial work is required.

B. Over-excavation and replacement of unsuitable foundation soils and replacement with approved compacted fill will be compensated as agreed upon with the Owner.

3.02 Base Leveling Pad

A. Leveling pad material shall be placed to the lines and grades shown on the construction drawings, to a minimum thickness of 6 inches (150 mm) and extend laterally a minimum of 6" (150 mm) in front and behind the modular wall unit.

B. Soil leveling pad materials shall be compacted to a minimum of 95 % Standard Proctor density per ASTM D-698 or 92% Modified Proctor Density per ASTM D1557.

C. Leveling pad shall be prepared to insure full contact to the base surface of the concrete units.

3.03 Modular Unit Installation

A. First course of units shall be placed on the leveling pad at the appropriate line and grade. Alignment and level shall be checked in all directions and insure that all units are in full contact with the base and properly seated.

B. Place the front of units side-by-side. Do not leave gaps between adjacent units. Layout of corners and curves shall be in accordance with manufacturer's recommendations.

C. Install shear/connecting devices per manufacturer's recommendations.

D. Place and compact drainage fill within and behind wall units. Place and compact backfill soil behind drainage fill. Follow wall erection and drainage fill closely with structure backfill.

E. Maximum stacked vertical height of wall units, prior to unit drainage fill and backfill placement and compaction, shall not exceed two courses.

3.04 Structural Geogrid Installation

A. Geogrid shall be oriented with the highest strength axis perpendicular to the wall alignment.

B. Geogrid reinforcement shall be placed at the strengths, lengths, and elevations shown on the construction design drawings or as directed by the Engineer.

C. The geogrid shall be laid horizontally on compacted backfill and attached to the modular wall units. Place the next course of modular concrete units over the geogrid. The geogrid shall be pulled taut, and anchored prior to backfill placement on the geogrid.

D. Geogrid reinforcements shall be continuous throughout their embedment lengths and placed side-by-side to provide 100% coverage at each level. Spliced connections between shorter pieces of geogrid or gaps between adjacent pieces of geogrid are not permitted.

3.05 Reinforced Backfill Placement

A. Reinforced backfill shall be placed, spread, and compacted in such a manner that minimizes the development of slack in the geogrid and installation damage.

B. Reinforced backfill shall be placed and compacted in lifts not to exceed 6 inches (150 mm) where hand compaction is used, or 8 - 10 inches (200 to 250 mm) where heavy compaction equipment is used. Lift thickness shall be decreased to achieve the required density as required.

C. Reinforced backfill shall be compacted to a minimum of 95 % Standard Proctor density per ASTM D-698 or 92% Modified Proctor Density per ASTM D1557. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer and shall be dry of optimum, + 0%, - 3%.

D. Only lightweight hand-operated equipment shall be allowed within 3 feet (1m) from the tail of the modular concrete unit.

E. Tracked construction equipment shall not be operated directly upon the geogrid reinforcement. A minimum fill thickness of 6 inches (150 mm) is required prior to operation of tracked vehicles over the geogrid. Tracked vehicle turning should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.

F. Rubber tired equipment may pass over geogrid reinforcement at slow speeds, less than 10 MPH (15 KPH). Sudden braking and sharp turning shall be avoided.

G. At the end of each day's operation, the Contractor shall slope the last lift of reinforced backfill away from the wall units to direct runoff away from wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

3.06 Cap Installation

A. Cap units shall be glued to underlying units with an all-weather adhesive recommended by the manufacturer.

3.07 As-built Construction Tolerances

A. Vertical alignment: ± 1.5" (40 mm) over any 10' (3 m) distance.

B. Wall Batter: within 2 degrees of design batter.

C. Horizontal alignment: ± 1.5" (40 mm) over any 10' (3 m) distance.
Corners, bends & curves: ± 1 ft (300 mm) to theoretical location.

D. Maximum horizontal gap between erected units shall be ≤ 1/2 inch (13 mm).

3.08 Field Quality Control

A. Quality Assurance - The Owner shall/may engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction. This does not relieve the Contractor from securing the necessary construction control testing.

B. Quality assurance should include foundation soil inspection. Verification of geotechnical design parameters, and verification that the contractor's quality control testing is adequate as a minimum. Quality assurance shall also include observation of construction for general compliance with design drawings and project specifications. Quality assurance is best performed by the site geotechnical engineer.

C. Quality Control – The Contractor shall engage inspection and testing services to perform the minimum quality control testing described in the retaining wall design plans and specifications. Only qualified and experienced technicians and engineers shall perform testing and inspection services.

D. Quality control testing shall include soil and backfill testing to verify soil types and compaction and verification that the retaining wall is being constructed in accordance with the design plans and project specifications.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for Modular Retaining Walls in the Section shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. No separate measurement or payment will be made for these quantities and items.

END OF SECTION

SECTION 02900 – LANDSCAPE RESTORATION AND CLEANUP

PART 1 GENERAL

1.01 SUMMARY

A. This section covers the work necessary to reseed, restore and cleanup the site. Work shall include the removal of all construction equipment, rubbish, construction debris, and unused materials of any kind resulting from project activities.

B. Site cleanup shall include the clean up of all pavement surfaces, whether new or existing within the limits of the project and replacement of pavement markings.

PART 2 PRODUCTS

2.01 RESEEDING MATERIALS

A. Grass seed shall be from blue tag stock and from the latest crop available. Deliver each variety in standard containers labeled in accordance with Oregon State laws and U.S. Department of Agriculture rules and regulations under the Federal Seed Act. Provide with label showing seed variety, percentage of purity, germination, maximum weed content, date of test within nine months of date of delivery, and as set forth in the General Seed Certification Standard by the Oregon State University Certification Board. Mold or other evidence of container having been wet or otherwise damaged will be cause for rejection of each lot of seed. Grass seed may be delivered to the project as a mixture provided each variety of grass seed in the mixture is identified and labeled as specified.

B. Where imported topsoil is required, provide natural, fertile, friable topsoil, representative of local productive soil, and 90% free of clay lumps or other foreign matter larger than 2-inches in diameter, not frozen or muddy, with pH 5.0 to 7.0, and not less than 3% humus as determined by loss of ignition of moisture-free samples dried at 100° C. Gravel portion (particles larger than 2 mm) shall not exceed 15% of total volume. Topsoil shall be free of quack grass, horsetail and other noxious vegetation and seed. Should such regenerative material be present in the soil, all resultant growth, both surface and root, shall be removed by the Contractor within 1-year of acceptance of the work at no expense to the Owner.

C. Provide a lime compound of ground dolomitic limestone not less than 85% total carbonates and magnesium, ground so that 50% passes a number 100 sieve and 90% passes a number 20 sieve. Coarser material will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing the number 100 sieve.

D. Furnish fertilizer in moisture-proof bags marked with weight and the manufacturer's certified analysis of the contents showing the percentage for each ingredient. Furnish fertilizer in a dry condition free from lumps and caking, in granular or palletized form, of standard commercial grade conforming to all State and Federal regulations and to the standards of the Association of Official Agricultural Chemists.

E. Provide all other materials required to accomplish the work specified.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Surface Dressing

1. Slopes, sidewalk areas, planting areas, easements and roadways shall be smoothed and dressed to the required cross section and grade by means of a grading machine insofar as it is possible to do without damaging the work or existing improvements, trees and shrubs. Supplement machine dressing by hand work as directed.

2. Upon completion of the cleaning and dressing, the project shall appear uniform in all respects. Grade all areas true to line and grade as shown or as approved. Where the existing planting is below sidewalk and curb, fill and dress the area to the walk regardless of limits shown. Wherever fill material is required in the planting area, make finished surface high enough to allow for final settlement.

B. Remove and dispose of all excavated or construction materials, equipment, and rubbish of all kinds resulting from the work. Where brush and trees beyond the limits of the project have been disturbed or damaged, remove and dispose of or restore same, as directed, at no expense to the Owner.

C. Clean all drainage facilities such as inlets, catch basins, culverts and open ditches of all excess material or debris resulting from the work, to the satisfaction of the Owner.

D. Clean all pavement surfaces, whether new or existing within the limits of the project. Clean existing improvements such as curbs, gutters, walls, sidewalks, castings for manholes, monuments, water gates, lamp poles, vaults, signs, and other similar installations as approved. Flush the street with a pressure type flusher as approved. Hand sweep or flush all sidewalks as directed.

E. Fused thermoplastic stop bar and pavement markings shall be installed following manufactures recommendations for installation. Pavement surface shall be free of dirt, grease, moisture or any other foreign material prior to the placement of striping and pavement markings.

F. Unless otherwise specified by Engineer, disturbed areas adjacent to roadways shall be restored with Gravel Surfacing as specified in Section 02340.

G. Restoring Planted Areas

1. Hand rake and drag all formerly grassed and/or planted areas leaving disturbed areas free from rocks, gravel, clay, or any other foreign material and ready, in all respects, for seeding. The finished surface shall conform to the original surface, be free draining and free from holes, rough spots, or other surface features detrimental to a seeded area.

2. Plant grass seed only at times when local weather and other conditions are favorable to the preparation of the soil and to the germination and growth of grass. Sow grassed areas evenly with a mechanical spreader at a rate of one pound per 300 square feet, roll with cltipacker to cover seed, and water with fine spray. Method of seeding may be varied as approved, however, responsibility to establish a smooth, uniformly grassed area will not be waived.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT – SCHEDULE I AND II

A. Payment for Landscape Restoration & Cleanup will be made on a lump sum basis at the price stated on the Bid Form. Payment shall include all materials and labor required to complete the work described herein.

B. Payment for miscellaneous pavement markings, thermoplastic stop bars, and striping shall be considered incidental and cost shall be included within the lump sum cost of Site Cleanup & Landscape Restoration. A separate payment item will not be made for this item.

END OF SECTION

DIVISION 3- CONCRETE
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SECTION 03110 – STRUCTURAL CAST-IN-PLACE CONCRETE FORMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Concrete formwork required for all project structural concrete.

B. Formwork design, placement, proper securing and support, and removal.

C. Coordination for various wall and slab penetration locations and sizes including sleeve positioning for casting in place.

D. Positioning of anchor bolts, grating and vault lid frames, and other imbedded items.

1.02 RELATED SECTIONS

A. Section 03300 – Cast-In-Place Concrete

B. Section 03200 – Concrete Reinforcement

C. Section 03150 – Concrete Accessories

D. Hangers and Inserts for Mechanical and Electrical Work: Divisions 15 and 16

1.03 REFERENCES

A. American Concrete Institute (ACI) 318, Chapter 6 – Formwork, Embedded Pipes, and Construction Joints.

B. ACI 347R-88 – Guide to Formwork for Concrete.

1.04 QUALITY ASSURANCE

A. Forms shall be constructed by laborers experienced in concrete formwork erection.

B. Ensure that forms are smooth, vertically plumb or horizontally flat as applicable, and properly spaced to provide finished concrete structures as shown on the drawings.

C. Resulting work which is not in conformance with applicable contract specifications shall be promptly removed and replaced.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect form materials from damage that may affect finish appearance or form stability.

B. Keep forms clean and free from deleterious materials.

1.06 PROJECT CONDITIONS

A. Refer to drawings to estimate quantities and locations involved.

B. All exposed edges shall be properly formed and chamfered where shown.

C. Conduct required excavation and provide excavation support as necessary.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Lumber Plank
1. Species: Douglas Fir or Hemlock
2. Casting Face Texture: Smooth
3. Casting Face Appearance: No loose Knots or Knot Holes; maximum Knot size 1-1/2 inch and well scattered
4. Size: Support Concrete at rate poured
5. Extent of Work: Provide at Footing. Flatwork perimeters, curbing, and Pedestals, unless otherwise indicated.

B. Plywood Forms
1. Material: APA B-B Plyform grade Plywood Class 1
2. Thickness: As required by Concrete placement rate
3. Extent of Work: Provide at all other Concrete Work

C. Steel

2.02 ACCESSORIES

A. Form Ties
1. Manufacturer: Bowman, Burke, Dayton, JEF, or approved
2. Type: Plastic Cone as recommended by Manufacturer for conditions of use
3. Break-back Distance from Concrete Face: 1-inch
4. Do not use wire ties and wood spacers

B. Form Release Agents
1. Non-staining, VOC compliant, water-based Form Release Compound. Should be opaque in color to aid in full coverage.
2. W.R. Meadows "Duogard II", or approved equal.

C. Form Joint Caulking
1. Manufacturer and Brand: Sonneborn Sonolac, Dap Acrylic Latex, or approved

PART 3 EXECUTION

3.01 PREPARATION

A. Ensure that reinforcing steel is properly placed according the spacing and tolerances required, and that proper inspection has been conducted.

B. Ensure waterstops are installed as required when placed prior to formwork.

C. Review plans for wall and slab penetrations and imbedded items.

D. Remove debris and foreign matter from formwork. Clean form contact surfaces. Replace with new material when necessary or when directed.

E. Remove loose rust and foreign matter from reusable hardware prior to installation into Formwork.

F. Re-use Forms only when contact surfaces equal original use and forms have been adequately cleaned.

3.02 INSTALLATION

A. Comply with ACI 318 and ACI 347.

B. Carefully conform to the shapes, lines and dimensions of the drawings. Ensure that edges are chamfered where shown. Form any Surface Indentations shown on the Drawings.

C. Arrange to provide concrete cold joints as indicated on the drawings.

D. At forms for exposed concrete, fill form panel joints with Form Joint Caulking Compound, and strike compound flush with panel on face adjacent to exposed Concrete, or cover joints with thin, smooth, plastic, pressure-sensitive tape.

E. At forms for exposed concrete, seal Form Ties against leakage with Form Joint Caulking Compound.

F. Make form joints tight to prevent leakage. Minimize the number of form joints used.

G. Ensure that formwork is properly supported, tied, and braced to prevent deflection and maintain shape (see allowable tolerances for formwork).
   1. Provide bracing as required to meet load requirements.
   2. Protect against undermining or settlement when placed on ground.
   3. Anchor as required to prevent upward or lateral Formwork movement during Concrete placement.
   4. Locate ties equidistant and symmetrical. Align vertically and horizontally.

H. Provide Access Openings as required for cleaning and inspection of Forms and Embedded Items prior to placing Concrete. Locate where not exposed to view.

I. Provide Openings and Chasings of Slabs and Walls for Mechanical and Electrical Work. Sizes and locations are directed by Mechanical and Electrical Trades and Drawings.

J. Anchor Bolts: Set with templates to assure accurate bolt positioning

K. During Concrete placement, in areas where Formwork develops weakness, settlement, or distortion, stop concrete placement, remove placed concrete, and remove or strengthen Formwork.

L. Reposition to true alignment prior to, during, and after Concrete placement, if necessary.

3.03 ALLOWABLE TOLERANCES FOR FORMWORK

A. Variation from Plumb: 1/4 inch in 10 feet maximum

B. Variation of Building Lines: 1/4 inch in any Bay or 20 feet maximum

C. Variation in Cross-Sectional Dimensions: Minus 1/8 inch; plus 1/4 inch

D. Variation in Surface Tolerance: 1/8 inch in any 10 feet measured with 10-foot straightedge.

E. Maximum Deflection of Form facing between Supports: 0.00025 x Span

F. Wall Locations: Accurately size and locate within 1/8 inch.

3.04 FORM TREATMENT

A. All forms shall be adequately treated with form release agent to prevent concrete damage during form removal.

B. Prior to each use: Apply form coating to contact surfaces in accordance with Manufacturer's instructions. Conduct surface preparation in accordance with manufacturer's instructions prior to coating forms.

C. When treating previously set forms, carefully prevent coatings from covering reinforcing steel, waterstops, imbedded items, or existing concrete.

D. Prevent coatings from collecting in puddles.

3.05 FORM REMOVAL

A. Leave forms and shoring in place until concrete has attained sufficient strength to safely support own weight and imposed loads.

B. Remove forms at time and in manner to insure safety of structure, and without concrete surface damage.

C. At exposed concrete, form removal time shall be uniform to avoid color differences.

D. Remove top forms from any sloping concrete surfaces as soon as concrete is self-supporting. Repair and finish, if necessary, and cure immediately.

3.06 CLEANING AND REPAIRING

A. Including Work of other Trades, clean, repair, and touch-up, or replace when directed, products which have been soiled, discolored, or damaged by Work of this Section.

B. Remove debris from Project Site upon Work completion, or sooner if directed.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for concrete formwork shall be included as a portion of the lump sum or unit price costs for the associated items as stated in the Bid Form. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 03152 – PREMOLDED EXPANSION JOINT FILLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Premolded Expansion Joint Fillers.

1.02 REFERENCES

A. ASTM D 1751 – Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction
B. ASTM D 1752
C. AASHTO M 213
D. Corps of Engineers: CRD-C 508
E. FS – Federal Specification

1.03 RELATED SECTIONS

A. Section 03300 – Cast-In-Place Concrete

1.04 QUALITY ASSURANCE

A. Manufacturer shall demonstrate five years (minimum) continuous, successful experience in production of items covered in this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean dry area indoors in accordance with manufacturer's instructions. Keep containers sealed until ready to use.

C. Protect materials during handling and installation to prevent damage or contamination.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fiber Expansion Joint

1. Resilient, flexible, non-extruded, expansion-contraction joint filler. Cellular fibers securely bonded together, uniformly saturated with asphalt.
2. Compliance: ASTM D 1751; AASHTO M 213; FS HH-F-341 F, Type I.
3. Recovery when compressed to half width: 70% minimum
4. Use: exterior expansion joints in sidewalks, drives, and between adjoining structures.

B. Flexible Foam Expansion Joint

1. Synthetic isomeric polymer foam, closed-cell, non-gassing. Gray in color.
2. Compliance: ASTM D 5249; ASTM D1752 5.1-5.4.
3. Recovery: 99% minimum
4. Use: interior expansion joints.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions at locations shown on the drawings and as directed.

B. Position joint filler against forms, at interrupting objects, and against abutting structures before placing concrete.

C. Install joint filler ½-inch below concrete surface.

D. Seal with flexible joint sealant.

E. Protect from traffic or damage until sealant has fully cured.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT –

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for expansion joint fillers shall be included as a portion of the lump sum cost for the Project as stated on the Bid Form. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 03200 – CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes reinforcement for concrete including deformed steel bars, welded-wire-fabric, and fiber reinforcement.

B. Supply, detail shop drawings, and place reinforcement.

C. Provide reinforcing to the sizes and dimensions shown on the drawings and according to approved shop drawings for rebar placement.

1.02 RELATED SECTIONS

A. Section 03110 – Structural Cast-In-Place Concrete Forms

B. Section 03300 – Cast-In-Place Concrete

C. Hangers and Inserts for Mechanical and Electrical Work: Divisions 15 and 16

1.03 REFERENCES

A. American Standards for Testing and Materials (ASTM), latest edition
   1. ASTM A 615 – Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
   2. ASTM A 185 – Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
   3. ASTM A 82 – Specification for Steel Wire, Plain, for Concrete Reinforcement

B. American Concrete Institute (ACI), latest edition
   1. ACI 315 – Details and Detailing of Concrete Reinforcement
   2. ACI 318 – Building Code Requirements for Reinforced Concrete

C. Uniform Building Code (UBC) – As amended to the "Oregon Structural Specialty Code" by the Oregon Building Codes Division, year 2008 amendments.

D. Concrete Reinforcing Steel Institute (CRSI)
   1. CRSI Manual of Standard Practice, 1997
   2. CRSI Reinforcing Bar Detailing, 1999
   3. CRSI 63 – Recommended Practice for Placing Reinforcing Bars
   4. CRSI 65 – Recommended Practice for Placing Bar Supports

1.04 SUBMITTALS

A. Certified Mill Test Reports for steel.

B. Detail and placement drawings. Submit in accordance with Section 01300 at least 14 days prior to reinforcement fabrication.
   1. Reinforcing steel shall be detailed in accordance with the "ACI Detailing Manual" (SP-66), ACI Committee 315; CRSI; and in conformance with the project drawings.
   2. Shop drawings shall include sufficient plan, section, and elevation drawings of all beams, walls, slabs, footings, columns, and other shapes to clearly show all reinforcement details, spacing, and sizes.
   3. Bends, splices, hooks, ties and all other details shall be shown. Drawings shall indicate any fieldwork required.

4. Shop drawings shall show steel specifications and conformances.

C. Samples of all proposed bar supports with a written description of where each support is proposed to be used.

1.05 QUALITY ASSURANCE

A. Coordinate with other Trades affecting or affected by Work of this Section.

B. Bends, hooks, laps, splices, cover, and other details shall conform to UBC, Chapter 19; and ACI 318, except where more stringent requirements are shown in the drawings or specified herein.

C. Perform reinforcement work in accordance with CRSI Documents 63 and 65.

D. Conduct field measurements as necessary prior to fabrication. Conform to the approved detail and placement drawings.

E. All materials shall be new, unused, specifically manufactured for the intended purpose.

F. Any welding shall be conducted by persons with Welder Certification in accordance with AWS D1.4.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered properly bundled and labeled to show grade, size and location. Deformed bars shall be marked with the letter "S" per ASTM A 615. Deliver with suitable hauling and handling equipment.

B. Properly store to protect from moisture. Cover steel with waterproof covering and store so that materials are not against unprotected earth.

C. Handle material carefully to protect from cuts, nicks, kinks, deformation, and other damage. Ensure worker safety.

PART 2 PRODUCTS

2.01 REINFORCEMENT MATERIALS

A. Reinforcing Bars for Concrete
1. All structural reinforcement shall be deformed bars.
2. Deformed billet steel; ASTM A 615, Grade 60 or Grade 40

B. Welded Wire Fabric
1. Use only where shown.
2. Supply flat sheets; ASTM A 185 with wire conforming to ASTM A 82
3. 6-inch by 6-inch mesh spacing
4. Wire Size: W1.4, unless otherwise shown on drawings.

2.02 ACCESSORIES

A. Provide all Accessories necessary for proper Reinforcement placement, spacing, support, and fastening. Bricks, broken CMU, spalls, rocks or similar materials shall not be used for support of reinforcing steel.

B. Tie Wire: 16-gauge minimum, black annealed steel; acceptable patented system.

C. Bar Supports, Bolsters, Chairs and Spacers
   1. Sized and shaped for strength and support of reinforcement during installation and placement of concrete. Use only approved materials.
   2. High density concrete dobies. Compressive strength equal or greater than concrete to be placed. No plastic or low cement content dobies accepted.
   3. Chairs: Stainless steel. With plastic tips when used at surfaces that will be exposed to view.
   4. Spacers: Plastic wheel type. Preco Barspan Wheels, or approved equal.
   5. Plastic Shims may be used to support plastic spacers.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that surfaces to receive Reinforcement are accurately sized and located, square, plumb, rigid, secure, and otherwise accurately prepared.

B. Prior to starting Work, notify General Contractor about defects requiring correction.

C. Reinforcement shall be free from mud, oil or other nonmetallic coatings that decrease bond.

D. Remove surface rust and mill scale with wire brush. Heavily rusted bars shall not be used.

E. Do not start Work until conditions are satisfactory.

3.02 PLACEMENT

A. Perform reinforcement work in accordance with CRSI Documents 63 and 65, and fabricate in compliance with ACI 315.

B. Conform to approved placement and detail drawings and specified tolerances herein.

C. Reinforcement shall be accurately placed and adequately supported before concrete is placed, and shall be secured against displacement within the tolerances of this section.

D. All reinforcement shall be bent cold unless otherwise permitted by the Engineer.

E. Reinforcement partially embedded in concrete shall not be field bent unless approved by the Engineer.

F. Do not weld splices, crossing bars, or other locations.

G. Splices: Locate splices not indicated on the drawings at points of minimum stress. Development length and splices shall conform to UBC Section 1912. At wire mesh, lap one full mesh plus 2-inches. Clear distance between spliced bars shall conform to UBC Section 1907.6. Splices of adjacent bars shall be staggered. Use greater splice lengths where shown in the drawings.

H. Spacing: Comply with UBC Section 1907.6, contract drawings, and approved shop drawings.

I. Protective Concrete Cover: Comply with UBC Section 1907.7.1 minimums. Provide greater cover where shown in the drawings.

J. Bars in slabs shall be supported on well-cured concrete blocks or approved metal chairs.

K. Tolerances:
1. Concrete Cover: Plus or minus ¼ inch.
2. Spacing Between Bars: ¼ inch.

L. Bar relocation to avoid interference with other reinforcement, conduits or embedded items: 1 bar diameter, unless otherwise approved by Engineer.

M. Reinforcement Around Openings: Unless otherwise shown on the drawings, place at least double the area of steel removed by the opening around the opening and extend on each side sufficiently to develop bond in each bar. At square or rectangular openings, place at least one diagonal bar at each corner.

3.03 PROTECTION

A. Protect other Work against damage and discoloration caused by Work of this Section.

B. Protect placed reinforcement from subsequent movement and inclement weather until concrete is placed.

3.04 FIELD QUALITY CONTROL

A. The Engineer shall be notified when reinforcing steel is ready for inspection. Inspection must occur before any concrete is placed.

B. Notify Engineer at least 48 hours in advance and allow sufficient time for inspection.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for concrete reinforcement work shall be included as a portion of the lump sum or unit price costs for the associated items as stated in the Bid Form. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 03300 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes work required to supply, place, finish and cure cast-in-place concrete, including mix design, certifications, submittals and testing.

B. Furnish and install vapor barrier and sand base under floor slabs-on-grade.

C. Installation of inserts, sleeves, anchor bolts, grounding cable and other items embedded in concrete, but furnished under other sections.

D. Rinsing out of transit mix trucks, washing or wetting of concrete, site cleanup, or other activity related to water at the site shall be in conformance with all EPA requirements for the prevention of water runoff to storm water sewers or creeks.

1.02 RELATED SECTIONS

A. Section 03110 – Structural Cast-In-Place Concrete Forms
B. Section 03152 – Premolded Expansion Joint Fillers
C. Section 03200 – Concrete Reinforcement
D. Section 07920 – Joint Sealants

1.03 REFERENCES

A. American Standards for Testing and Materials (ASTM), latest editions
   1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field
   2. ASTM C33 – Specification for Concrete Aggregate
   3. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
   4. ASTM C94 – Standard Specification for Ready-Mixed Concrete
   5. ASTM C143 – Standard Test Method for Slump of Hydraulic Cement Concrete
   6. ASTM C150 – Standard Specification for Portland Cement
   7. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
   8. ASTM C260 – Standard Specification for Air Entrained Admixtures for Concrete
   9. ASTM C309 – Standard Specification for Liquid Membrane – Forming Compounds for Curing Concrete
   10. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete
   11. ASTM C618 – Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

B. American Concrete Institute (ACI), latest editions
   1. ACI 301 – Standard Specification for Structural Concrete in Buildings
   2. ACI 304R – Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
   3. ACI 305R – Recommended Practice for Hot Weather Concreting
   4. ACI 306R – Recommended Practice for Cold Weather Concreting
   5. ACI 309R – Guide for Consolidation of Concrete
   6. ACI 318 – Building Code Requirements for Reinforced Concrete
   7. ACI SP-15 – Field Reference Manual *(have copy on-site)*

1.04 SUBMITTALS

A. Contractor is responsible for the design of the concrete mix that shall conform to ASTM C94 and the requirements of this section.

B. Certified Mix Design: Prior to delivery of concrete, and allowing sufficient time for review, submit three copies of mix design, for each type of concrete, showing all materials used and proportions matching units specified. Submittal shall allow for easy comparison to the specifications and shall show all material compliances. Submittal shall clearly identify the mix as proposed for this project, with project name shown.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.
B. Conform to ACI 305R in hot weather.
C. Conform to ACI 306R in cold weather.
D. Installer Qualifications: Concrete work shall be finished by persons with at least 5 years experience with work of similar scope and quality.
E. No chloride containing admixtures shall be used.
F. On-Site water addition to concrete will not be permitted.
G. Conduct field-testing as specified.
H. Admixtures shall be added in strict conformance with the manufacturer's instructions.

1.06 DELIVERY

A. Concrete shall be scheduled and delivered in a timely manner in accordance with ASTM C94 and ACI 304R. Ensure that forms and reinforcement are complete and ready to accept concrete prior to scheduling delivery.

B. When installing a continuous pour section, ensure that trucks arrive and concrete is placed with no greater than 45 minutes elapsing between lifts.

PART 2 PRODUCTS

2.01 PORTLAND CEMENT

A. Conforming to ASTM C150. Type I and Type II where designated.

B. Use same brand and source of cement throughout the project.

2.02 WATER

A. Water used for mixing shall be clean and potable.

2.03 AGGREGATE

A. Aggregates shall be natural materials conforming to ASTM C33 as modified herein.

B. Aggregates shall be nonreactive as defined in ASTM C33 and tested per ASTM C289.

C. Aggregate shall contain no soil, friable particles, organic matter, or other deleterious materials. Aggregate shall be washed prior to use in the concrete mix.

D. Aggregates shall contain no chert, limestone, or shale.

E. Coarse Aggregate:
1. Use coarse aggregate from only one source for exposed concrete in a single structure.
2. Coarse aggregate shall be smooth, rounded and uniform. No more than 15% shall be elongated (max. dimension 5 times min. dimension).
3. Coarse aggregate shall be durable, sound and hard.
4. Maximum Size: 1-inch, but not more than one-fifth of narrow dimension between sides of Formwork, one-fourth depth of slab, nor three fourths of narrowest distance between Reinforcing Steel.

F. Fine Aggregate:
1. Use fine aggregate from only one source for exposed concrete in a single structure.
2. Fine aggregate shall not exceed 40% by weight of combined aggregate total, except when coarse aggregate maximum size is ½-inch or less.
3. Fine aggregate shall be durable, sound, clean and hard.
4. Sand Equivalent of 75 minimum per ASTM D2419.

G. Combined (Coarse and Fine) Gradation per ASTM C136:

US Standard Sieve	% Passing by Weight
1½-inch	100
1-inch	90-100
3/8-inch	45-75
No. 4	33-50
No. 8	28-44
No. 16	23-38
No. 30	10-22
No. 200	0-2

2.04 ADMIXTURES

A. General:
1. When two or more admixtures are used, they shall be certified by the manufacturer(s) to be compatible.
2. Chlorides are not permitted in any form.
3. Air Entraining and Water Reducer admixtures are required.
4. All admixtures shall be added at the batch plant, unless otherwise specified.

B. Fly Ash:
1. Conforming to ASTM C618, Class F except maximum ignition loss shall not exceed 30% by weight.
2. Fly ash may be used to replace up to 15% by volume of the Cement content, provided that the mix strength is substantial by test data.
3. Fly ash shall be produced from a single known and consistent source.

C. Midrange Water Reducer:
1. Shall conform to ASTM C494, Type A and F.
2. Master Builders, Inc. "PolyHeed" Series; or approved equal.

D. High-Range Water Reducer (Superplasticizer):
1. Shall conform to ASTM C494, Type F or G; and ASTM C1017, Type I or II.
2. Master Builders, Inc. "Rheobuild"; or approved equal.

E. Air-Entraining Admixture:
1. Shall conform to ASTM C260.
2. Master Builders, Inc. "MicroAir", "MB-AE 90"; or approved equal.

F. Fibrous Concrete Reinforcement: Shall be "Fibermesh MD" added at a minimum of 1.5 pounds per cubic yard. Use where specified or shown on the drawings.

G. Others: Only as approved and deemed necessary.

2.05 BONDING AGENT

A. Required where new concrete is poured against existing concrete, and on embedded items with less than 1½-inches of cover.

B. 100% solids, two component epoxy bonding compound meeting ASTM C881, Type II, Grade 2, Class B or C materials except as modified herein.

C. Properties:
1. Bond Strength @ 14 days (ASTM C882) – 1800 psi minimum
2. Tensile Strength @ 7 days (ASTM D638) – 4400 psi minimum
3. Tensile Elongation @ 7 days (ASTM D638) – 1.49% maximum

D. Master Builders, Inc. "Concresive Liquid PL"; or approved equal.

2.06 CURING COMPOUNDS AND SEALERS

A. Evaporation Reducer: Spray applied monomolecular film that reduces the rate of surface moisture evaporation, minimizes plastic shrinkage, and does not effect the cement hydration process. Master Builders, Inc. "Confilm"; WR Meadows "Sealtight Evapre"; or approved equal.

B. Exterior Use Liquid Membrane-Forming Curing Compound: Shall conform to ASTM C309, Type I, Class B and ASTM C1315, Type 1, Class A. WR Meadows "CS-309-25"; or approved equal.

C. Interior Use Liquid Membrane-Forming Curing Compound: Water-base acrylic curing and sealing compound conforming to ASTM C309, Type I, Class B and ASTM C1315, Type 1, Class A. WR Meadows "Vocomp-25-1315"; or approved equal.

D. Concrete Sealer: Non-yellowing, acrylic co-polymer solution meeting ASTM C309, Type 1, Class B and ASTM C1315, Type 1, Class A. WR Meadows "TIAH 1315"; or approved equal.

2.07 CONCRETE HARDENERS

A. Liquid concrete densifier and hardener, chemical resistant, colorless, with 100% active chemicals. WR Meadows "Liqui-Hard"; or approved equal.

2.08 VAPOR BARRIER

A. ASTM D2103 – Polyethylene Film and Sheeting, 6 mils thickness.

2.09 STRUCTURAL REPAIR MORTAR

A. Shrinkage compensated, rheoplastic, one-component, cementitious based, hand or low velocity spray applied material suited for repairing distressed horizontal, vertical or overhead concrete.
1. Compressive Strength @ 24 hours (ASTM C109) – 3500 psi min.
2. Flexural Strength @ 28 days (ASTM C348) – 1300 psi min.

3. Freeze Thaw Resistance @ 300 cycles (ASTM C666-A) – 90% RDF min.
4. Modulus of Elasticity @ 28 days (ASTM C469) – $4.3x10^6$ psi

B. Master Builders, Inc. "Emaco S" Series; or approved equal.

2.10 STANDARD CONCRETE MIX

A. Use: Footings, Interior Slabs, Exterior Walks

B. Mix Design Requirements:
1. Cement: Portland Cement, Type I or II, ASTM C150
2. Water / Cementitious Materials Ratio: 0.45-0.50 by weight
3. Strength: 3500 psi minimum, ASTM C39
4. Air Content: 2.5-3% by volume, ASTM C231
5. Water Reducer: Mid or High-Range
6. Maximum slump at time of placement: 8-inches

PART 3 EXECUTION

3.01 PREPARATION

A. Examine all reinforcement, formwork, waterstops, premolded joint fillers, and other embedded items to ensure they are accurately placed, properly secured and cleaned.

B. Ensure that inspection of reinforcement is complete and installation approved.

C. Ensure concrete mix design and test certifications have been submitted and approved.

D. Ensure that all required materials and equipment are on-site and operable.

E. Ensure that subgrade and base rock are properly placed and compacted. Place vapor barrier and leveling sand at slab-on-grade locations. Sprinkle subgrades and other porous surfaces with water to reduce adsorption.

F. Apply form release agent to formwork.

G. Apply bonding agent where required.

H. Notify General Contractor of work requiring correction. Do not start work until conditions are satisfactory.

I. Review for various locations to receive different types of concrete mixes.

J. Notify Engineer at least 24 hours in advance of concrete placement.

3.02 VAPOR BARRIER AND SAND COVER

A. Place vapor barrier on top of rock base under all interior slabs-on-grade. Barrier shall be continuous under construction joints. The edges of the vapor barrier shall be lapped and taped, and all projections through it shall be taped and sealed.

B. The vapor barrier shall be covered with a sand cover, 2-inches thick or as shown on the drawings. At the time of placing concrete, the sand shall be damp but excess water shall not be trapped on top of the vapor barrier.

3.03 CONCRETE PLACEMENT

A. Comply with ACI 304 and ASTM C94, and ACI 305R and 306R as required.

B. Convey and place by methods with will prevent material separation, segregation, and loss.

C. Deposit concrete continuously or in layers so that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or other planes of weakness. Where seams are unavoidable, provide construction joints as directed.

D. Do not convey pneumatically placed concrete through aluminum pipe.

E. Do not retemper concrete, or add water on-site for other reasons.

F. Use trunks or tremies when pouring walls to ensure concrete does not drop or fall more than 4 feet. Place in layers not exceeding 2 feet in depth.

G. Screed all slabs to true levels or slopes, true within ¼ inch per 10 feet. Evenly slope to any drain at 3/16 inch per foot, unless otherwise shown on Drawings.

H. When mean temperature exceeds, or is expected to exceed 80°F during placement and finishing operations, steps shall be taken in accordance with ACI 305R to reduce concrete temperature and water evaporation. Slabs will be fog sprayed from the completion of screeding until curing is begun (except during troweling). Submit detailed hot weather concreting procedure to Engineer for approval at least 2 days prior to planned placement.

I. When mean temperature falls below, or is expected to fall below 40°F, comply with ACI 306R. Concrete shall be protected from freezing by means acceptable to the Engineer. Submit detailed cold weather concreting procedure to Engineer for approval at least 2 days prior to planned placement.

3.04 CONSOLIDATION

A. Employ mechanical, high frequency vibrators to consolidate concrete around reinforcement, into corners and angles of formwork, and to exclude rock pockets, air bubbles and honeycomb.

B. Vibration shall be in accordance with ACI 309. Vibrator frequency shall be between 8000 and 12000 rpm.

C. Hold Vibrator in one spot no longer than 15 seconds; keep in constant motion, insert and withdraw at points approximately 18 inches o.c.

D. Maintain vibrator in vertical position when penetrating concrete walls. At slabs, hold vibrator perpendicular to the surface at all times.

E. Vibrate each successive lift. Extend vibrator into previous lift to avoid seams.

F. Transporting concrete with vibrator is not permitted.

G. Maintain spare vibrator at jobsite during concrete placement.

3.05 CONTROL JOINTS

A. Form to true, straight lines, with adjacent slab sections flush at Joints. Make panels as close to square as possible.

B. Conform to ACI 302 and the Project Drawings. If not shown, submit control joint layout plan to Engineer for approval.

C. Joints shall be formed by tooling into fresh concrete. The joint shall be perpendicular to the concrete surface and ¼ of the thickness of the slab. Zip strips not allowed.

D. Fill joint as specified in Section 07920.

E. Extend Reinforcement through Joints, unless otherwise shown on Drawings.

F. If necessary, and approved by Engineer, joint may be saw cut as soon as concrete has sufficiently hardened to prevent dislodging of aggregates. Saw continuous slots perpendicular to surface and ¼ of slab thickness. Must be complete within 12 hours of concrete placement.

3.06 FINISHES

A. Rough Form Finish
   1. Finish resulting after form removal with fins or projections exceeding ¼-inch removed, and with tie holes and defective areas repaired and patched.
   2. Location: Formed concrete surfaces not exposed to view in the finished structure.

B. Standard Smooth Finish
   1. As-cast surface with all fins and projections completely removed and smoothed, and with all tie holes and defective areas repaired and patched for a uniform, smooth appearance.
   2. At unformed surfaces, such as tops of walls, strike-off smooth and finish with a texture matching adjacent surfaces.
   3. Location: Formed surfaces exposed to view in the finished structure.

C. Float Finish
   1. After placing slabs, do not work the surface until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently to permit the operation of a power-driven float, or by hand-floating if area is small or inaccessible to power units.
   2. Check the level of the surface plane to a tolerance not exceeding ¼-inch in 10 feet when tested with a 10-foot straightedge placed on the surface in not less than two different angles from a reference point. Cut down high spots and fill low spots. Uniformly slope surfaces to drain where shown on the drawings.
   3. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture. Do not overfinish.
   4. Location: Monolithic slab surfaces that are to receive a trowel finish and other finishes.

D. Trowel Finish
   1. After floating, begin the first trowel finish operation using a power driven trowel. Consolidate the concrete surface by the final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8-inch in 10 feet when tested with a 10-foot straightedge.

2. Do not absorb wet spots with neat cement or cement-sand mixture, and do not use chemical dryers.
3. Location: Monolithic slab surfaces exposed to view, or to be covered with resilient floor covering, or to receive liquid hardener treatment.

E. Nonslip Broom Finish
1. After concrete has received floating finish specified above, provide light brushing with fiber-bristle broom perpendicular to traffic flow.
2. Location: Exterior walks and other horizontal walking surfaces.

3.07 CONCRETE SURFACE REPAIRS

A. After removal of forms, repair and patch defective areas with specified repair mortar.

B. In honeycomb and rock pocket areas, saw cut area and remove material down to solid concrete. Saw cut edges perpendicular to the concrete surface. Thoroughly clean out loose material, saturate area with water to a saturated surface dry condition and brush-coat the area to be patched with a slurry coat of structural repair mortar. Place additional mortar to patch the area before the slurry coat has dried. Smooth and blend to surrounding surface. Do not feather edges.

3.08 CONCRETE CURING AND PROTECTION

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete from rapid moisture loss before and during finishing operations with a fog spray or evaporation reducer. Apply evaporation reducer in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Curing shall begin as soon as the finishing operation has been completed and the surface will not be damaged by the curing method. Curing shall be maintained for not less than 7 days.

C. Curing Methods: Perform curing of concrete by curing compound, by moist curing, by moisture-retaining cover curing, or combinations thereof, as specified herein.

1. Moist Curing. Use one of the following methods
   a) Keep concrete surface continuously wet by covering with water
   b) Use continuous water-fog spray
   c) Cover concrete with absorptive cover (burlap cloth, 9 oz./s.y.), thoroughly saturate with water, and keep continuously wet. Completely cover all concrete and lap edges 4-inches. Place moisture retaining cover (polyethylene film) over absorptive cover.

2. Moisture-Retaining Cover. Cover all surfaces completely with polyethylene sheets, lap edges at least 3-inches, and seal with waterproof tape. Immediately repair any holes or tears with sheet material and tape.

3. Curing Compound. Use specified compound and apply in accordance with manufacturer's instructions. Apply within 1 hour of final finishing operations or form removal. Maintain continuity of coating and protect from damage during curing period. If finish materials are to be applied later, follow manufacturer's instructions for compound removal.

D. Exterior Structural Concrete: Cure for 7 days with moist cure or moisture-retaining cover. After 7 day period, apply specified or approved sealing compound to surfaces that will be exposed in the finished structure.

E. Exterior Sidewalks and Ramps: Cure for 7 days with moist cure or moisture-retaining cover. After 7 day period, apply specified or approved sealing compound to surfaces that will be exposed in the finished structure. Or; cure for 7 days using specified or approved exterior curing/sealing compound.

F. Interior Slabs to be Covered (with resilient flooring): Cure for 7 days with moist cure or moisture-retaining cover. Or; cure for 7 days using specified or approved interior curing/sealing compound. Ensure compound compatibility with adhesives.

G. Interior Slabs Exposed and Other Exposed Interior Concrete: At interior slab locations that will remain uncovered, interior curbs, equipment pads, etc., cure for 7 days with moist cure or moisture-retaining cover. After 7days, or as recommended by the manufacturer, apply liquid chemical hardener. Follow manufacturer's instruction for hardener application. Apply at least two coatings unless otherwise recommended by the manufacturer and approved. Protect adjoining work from overspray and remove all excess hardener from surface of floor slab.

H. Protect all surfaces from damage until curing is complete and sealers and hardeners have dried.

3.09 CORRECTION OF DEFECTIVE WORK

A. Remove and replace any concrete which shows excessive cracks or severe damage. Remove and replace slabs which do not drain properly, or are improperly finished, and other defective concrete as directed.

B. Should concrete fail to meet the minimum specified 28 day strength as determined by tests on both the regular and spare cylinders, the concrete will be deemed defective and shall be removed and replaced. Contractor shall bear the entire cost of such testing, removal, redesign, and replacing of defective concrete.

C. Concrete which has improper water/cement ratios, and/or improper air contents shall be removed and replaced as directed.

D. Contractor shall bear all costs for removal and replacement of defective work.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for concrete and other work in this section shall be included as a portion of the lump sum bid item for the Control Building, as stated in the Bid Form. No separate measurement or payment for these quantities will occur.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Grout shall be included within the respective unit prices for each type of pipe, manholes, services and associated appurtenance items. No separate measurement or payment will be made for these quantities and items.

END OF SECTION

SECTION 03480 – PRECAST UTILITY VAULT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section specifies all work necessary to furnish and install complete precast utility vaults.

B. Vault shall be provided as shown in Plans.

1.02 SUMMARY

A. Vaults shall be provided as shown in Plans and specified herein. Vaults shall be provided complete with access doors and accessories as specified or as shown on the Plans. Vault shall be installed according to manufacturer's recommendations and as indicated in the Plans.

1.03 REFERENCE

A. Section 02000 – Site Work

B. Section 03600 – Non-Shrink Grout

1.04 QUALITY ASSURANCE

A. Manufacturer shall specialize in manufacture of precast utility vaults and shall have at least 5 years experience fabricating and installing precast, in-ground vaults.

B. Vault and doors shall be manufactured to withstand H20 wheel loading in off street locations. All doors shall be H20 rated unless otherwise specified on the Plans or in these Specifications. Calculations shall be made available to Engineer upon request.

1.05 WARRANTY

A. Warranty shall meet the standard warranty requirement as outlined in the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Strictly follow manufacturer's recommendations regarding deliver, unloading and handling of vault sections.

B. Contractor shall schedule delivery of vault to minimize storage time and to avoid construction delays.

1.07 SUBMITTALS

A. Submit product data in accordance with Section 01300.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The precast utility vault shall be manufactured by Utility Vault Oldcastle; or approved equal.

a. Flow meter vault Oldcastle Utility Vault 507-LA or Oldcastle Valve Pit vault constructed to Contract drawings; or approved equal.

b. Valve vault Oldcastle Valve Pit vault constructed to Contract drawings; or approved equal.

2.02 CONSTRUCTION

A. Vault

a. Vaults shall be precast reinforced concrete base, sections and flat top lids. All components shall be structurally sufficient for the intended use. Flat top lids and access doors shall withstand H20 wheel loading.

b. Vault shall be ordered with reinforcement set to accommodate pipe penetrations as shown in the Plans.

c. Joints shall utilize rubber gaskets conforming to ASTM C443. Install per manufacturer's recommendations.

d. Assembled vault shall be made watertight.

B. Access Door

a. Access doors shall be sized as indicated on the Plans.

b. Access door shall be constructed of galvanized steel, reinforced to withstand AASHTO H-20 wheel loading in off-street locations. Cover shall be diamond-tread plate.

c. Latch shall be stainless steel slam lock with fixed interior handle.

d. Handle shall be a recessed stainless steel handle.

e. Each door shall be equipped with spring lift assistance and automatic hold-open arms with grip handle release. Each door shall be easily opened by one person with one hand operation. Door shall lock open in the 90° position.

f. Finish shall be mill finish with bituminous coating applied to the exterior of the frame in all areas expected to come into contact with concrete.

g. Hatch shall be capable of withstanding H20 wheel loads in off-street locations. The hatch frame shall be cast into the vault lid by the manufacturer.

h. Access hatch clear openings shall be as shown on Plans.

i. Access hatch shall be equipped with integral fall protection grates that remain in closed position when doors are opened.

C. Ladder

a. Ladder shall be painted using the interior paint system for Structural Steel outlined in Section 09900.

b. Mounting brackets shall be hot-dipped galvanized.

c. Anchor bolts shall be stainless steel.

D. Pipe Penetrations

a. Pipe penetrations shall be core drilled to sizes indicated on the Plans or as necessary. Jack-hammering is not allowed.

b. Pipes shall be sealed to opening with Kor-N-Seal flexible coupling, or equal.

c. Grout shall be installed in a workmanlike manner to insure filling of all voids in the joint, and in accordance with Section 03600.

d. Pipe penetrations shall be made watertight.

PART 3 EXECUTION

3.01 INSTALLATION

A. Excavation for vault shall comply with the pertinent sections of Section 02315 Trench Excavation, Bedding & Backfill and Section 02316 Excavation & Select Backfill.

B. Provide shoring, bracing, dewatering and foundation stabilization as specified and as required.

C. Place and compact minimum eight (8) inches of aggregate base as shown in the details and plans.

D. Install vault in accordance with manufacturer's instructions.

E. Precast concrete base shall be carefully placed on the prepared bedding so as to be fully and uniformly supported at true grade and alignment.

F. Clean tongue and grooves of base and top section, apply rubber gasket per manufacturer's instructions.

G. Backfill as specified, per Plans, and as follows:

a. Backfill around the vault should consist of good compactable material such as ¾-inch minus pea gravel, crushed rock, clean sand, or approved class "A" backfill material, free from organic matter. In no case shall the material be saturated soil or contain rock larger than 2-inches. No voids shall remain between the vault walls and native soil of excavation.

b. Backfilling should not be done until the vault is completely assembled making certain to place backfill evenly around vault and compact backfill progressively in one foot lifts from the bottom to the top surface.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Pre-cast Utility Vault and related items, shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. Payment shall include compensation for all materials and labor required to complete the work described herein.

END OF SECTION

SECTION 03600 GROUT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes various types of grout as may be required for the project as shown on the Drawings and as required.

B. Work includes supply, preparation, mixing, application, finishing and curing of grout.

1.02 RELATED SECTIONS

A. Section 03200 – Concrete Reinforcement
B. Section 03300 – Cast-In-Place Concrete
C. Miscellaneous Sections of Divisions 5 and 11 for anchor bolts, base plates and other materials to be grouted or bonded in place.

1.03 REFERENCES

A. ASTM C1107 - Standards Specification for Packaged Hydraulic-Cement Grout (Nonshrink)
B. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars – Modified
C. ASTM C1090 - Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic Cement Grout
D. ASTM C939 - Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)
E. ASTM C827 – Test Method for Early Volume Change of Cementitious Mixtures
F. ASTM C882 – Test Method for Bond-Strength of Epoxy-Resin Systems Used with Concrete.
G. ACI 351 - Grouting for Support of Equipment and Machinery

1.04 SUBMITTALS

A. Submit list of each type of grout proposed for each location to be grouted. Include manufacturer's specifications, use recommendations, surface preparation and application instructions, and protection of adjacent surfaces.

B. Submit three copies of submittal package. Grout shall be approved prior to use.

1.05 QUALITY ASSURANCE

A. Grout Manufacturer shall be consulted when questions arise during selection of a particular grout for application. Grout used shall be as recommended by the manufacturer for each type of application.

B. Grout shall be mixed, placed and cured in strict conformance to the manufacturer's instructions. Surfaces to be grouted shall be carefully prepared according to the manufacturer's instructions. Improper surface preparation and curing are the most common causes of grout failure and problems.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's sealed containers with contents clearly labeled.

B. Store materials in a dry area at a temperature between 40 and 100°F.

PART 2 PRODUCTS

2.01 STANDARD NON-SHRINK GROUT

A. Non-metallic, non-bleeding, cement based non-shrink grout meeting ASTM C1107, Grades B or C. Pumpable and pourable with positive expansion per ASTM C827.

B. Compressive Strength at Flowable Consistency per ASTM C109: 2500 psi at 1 day, 5000 psi at 3 days, and 8000 psi at 28 days (minimums).

C. Use: Grouting around pipe and conduit penetrations in concrete slabs, and other locations where non-shrink grout is called for and other specified grouts are not required.

D. Manufacturers: Dayton Superior Corp. "1107 Advantage Grout"; ThoRoc " 621 Construction Grout; EUCO "NS Grout"; or approved equal.

2.02 PRECISION NON-SHRINK GROUT

A. High performance, non-metallic, non-bleeding, non-gaseous, chloride-free, cement based non-shrink grout meeting ASTM C1107, Grade C. Pumpable and pourable, vibration resistant, and heat and thermal shock resistant. Positive expansion per ASTM C827 and ASTM C1090.

B. Expansion: 0.01-0.07% at 1 day and 0.02-0.07% at 28 days when tested per ASTM C1107 in Fluid State.

C. Compressive Strength at Fluid Consistency per ASTM C1107: 4000 psi at 1 day, 6000 psi at 3 days, and 9000 psi at 28 days (minimums).

D. Use: Under base plates of equipment and other items where grout base is shown in the drawings or required.

E. Manufacturers: Dayton Superior Corp. "Sure-Grip High Performance Grout", "1107 Advantage Grout"; EUCO "Hi-Flow Grout"; or approved equal.

2.03 DRY PACK GROUT

A. Cement based, non-shrink, noncorrosive, non-metallic, high density, high strength grout for dry pack applications. Meets COE CRD-C-621.

B. Compressive Strength per ASTM C109: 3000 psi at 1 day, 6500 psi at 7 days, and 8000 psi at 28 days (minimums) at damp pack consistency.

C. Use: Pipe penetration patches in precast concrete, overhead applications and other areas where poured or pumped grout use is not practical.

D. Manufacturers: Dayton Superior Corp. "Sure-Grip Grout Dri-Pak"; W.R. Meadows "Pac-It"; EUCO "Dry Pack Grout"; or approved equal.

2.04 EPOXY GROUT

A. Multi-component, pre-proportioned epoxy grout. High impact and vibration resistance.

B. Compressive Strength per ASTM D695 at 50°F: 9200 psi at 1 day and 12000 psi at 14 days

C. Tensile Strength per ASTM D638 at 10 days: 2600 psi minimum

D. Flexural Strength per ASTM D790 at 14 days: 5000 psi minimum

E. Bond Strength per ASTM C882 at 14 days: 2200 psi minimum (to concrete)

F. Water Absorption per ASTM D570: 0.3%

G. Use: Deep pour applications (more than 4-inch thick), grouted rods and anchor bolts.

H. Manufacturers: Dayton Superior Corp. "Sure-Grip Epoxy Grout"; or approved equal.

2.05 ACCESSORIES

A. Aggregate: Washed pea gravel, maximum 3/8-inch size.

B. Water: Clean potable water.

C. Curing Compound: Water based, acrylic as recommended by grout manufacturer.

PART 3 EXECUTION

3.01 MIXING

A. Mix materials in accordance with the manufacturer's instructions.

B. Where grout depth will exceed 2-inches, add aggregate at a maximum rate of 25 pounds per 55 pound bag.

C. Do not retemper mix.

3.02 PREPARATION

A. Carefully prepare all surfaces to be grouted in accordance with the manufacturer's recommendations and as specified. Concrete must be cured for 28 days before placing grout.

B. Clean surfaces to remove loose and foreign material by waterblasting, mechanical abrasion, or sandblasting. Surface shall be free of dirt, oil, curing compounds and laitance.

C. Remove unsound concrete by chipping or grinding. Grind or sandblast steel surfaces to remove all rust, mill scale and paint.

D. Install forms to contain liquid grout. Seal joints and corners.

3.03 INSTALLATION – CEMENTITIOUS GROUTS

A. Follow manufacturer's instructions.

B. Just prior to grouting, thoroughly saturate concrete surfaces for 24 hours; remove excess water.

C. Place grout continuously by most practical means. Work from one side to avoid entrapped air.

D. Grout may be rodded or tamped, but do not vibrate.

E. Apply curing compounds to exposed grout in accordance with manufacturer's instructions or cure with wet burlap for 3 days. Curing shall commence immediately after placement.

3.04 INSTALLATION – EPOXY GROUTS

A. Follow manufacturer's instructions.

B. Allow surfaces to dry completely before grouting.

C. Place grout continuously by most practical means. Work from one side to avoid entrapped air.

D. For grout depths exceeding 3 inches, place grout in maximum 3-inch lifts; allow each lift to cure before placing next lift.

E. Consolidate material to eliminate voids and air pockets.

F. Lightly mist exposed grout with solvent, then steel trowel to smooth surface. Do not apply curing compounds.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Grout and other work in this section shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. No separate measurement or payment will be made for these quantities and items.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Grout shall be included within the respective unit prices for each type of pipe, manholes, services and associated appurtenance items. No separate measurement or payment will be made for these quantities and items.

END OF SECTION

DIVISION 4- MASONRY CONSTRUCTION
TABLE OF CONTENTS

SECTION 04050 – BASIC MASONRY MATERIALS & METHODS

PART 1 – GENERAL

1.01 SUMMARY

A. This Section describes the overall intent to provide a concrete masonry unit (CMU) building to house electrical and control equipment for operation of wastewater lift station planned as a part of this project. Coordinate with Division 16.

1.02 WORK INCLUDED

A. Provide concrete masonry units (concrete block), reinforcement, mortar, grout,

1.03 RELATED SECTIONS

A. Section 03200 – Concrete Reinforcement
B. Section 04065 – Masonry Mortar and Grout
C. Section 04220 – Concrete Masonry Units
D. Section 07920 – Joint Sealants

1.04 SUBMITTALS

A. Submit four (4) copies of all product data to engineer sufficiently early to avoid delays.

B. Manufacturer's Data: Provide complete description of each type of unit and accessory.

C. Certificate of Materials: Prior to delivery of materials to jobsite, submit certification from manufacturer showing compliance for specification of CMU. Certify compliance with ASTM C90. Certify mortar and grout compliance.

1.05 QUALITY ASSURANCE

A. Contractor shall have at least 5-years experience, regularly engaged in masonry work.

B. Continuous active supervisory mason-foreman in attendance while masonry work is in progress.

C. Provide CMU test results per ASTM C140 for production run to be used.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, handle, and store concrete masonry units by means that will prevent damage and contamination by other materials.

B. Do not use reinforcing anchors having excessive rust or foreign coatings.

C. Do not use units with chips, cracks, voids, or materials that may cause staining.

D. Protect stored CMU from water absorption.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: Comply with recommendations of IMIAWC (CW).

B. Hot Weather Requirements: Comply with recommendations of IMIAWC (HW).

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Concrete Masonry Units – Provide concrete masonry units from one manufacturer, of uniform texture and color. Submit manufacturer's data for approval. Mutual Materials, Oldcastle, Willamette Graystone, or approved equal.

B. Masonry Mortar and Grout – Mutual Materials DesignMix, or approved equal.

2.02 MATERIALS

A. Comply with material specifications of Sections 04065 and 04220.

2.03 ALTERNATIVE SUPPLIERS

A. Contractor may choose to purchase a pre-engineered CMU building package complete from a single supplier. If it is desired to utilize a CMU building package from a single supplier, some alterations to the building design may be allowed in order to comply with the supplier's standard products. Provide submittals identifying deviations from building design shown on Plans.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Comply with installation guidelines of Sections 04065 and 04220.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT – Schedule I Pump Station No. 4 Replacement

A. Cost for work and materials in this Section shall be included as a portion of the lump sum bid amount for the Project as stated on the Bid Form. No separate measurement for work in this Section will occur

END OF SECTION

SECTION 04065 - MASONRY MORTAR AND GROUT

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Mortar and grout for engineered CMU walls.

1.02 RELATED SECTIONS

A. Section 4220 – Concrete Masonry Units: for additional installation requirements for mortar and grout

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM), latest edition

1. ASTM C91 – Specification for Masonry Cement
2. ASTM C94 – Specification for Ready-Mix Concrete
3. ASTM C143 – Test Method for Slump of Hydraulic Cement Concrete
4. ASTM C144 – Specification for Aggregate for Masonry Mortar
5. ASTM C150 – Specification for Portland Cement
6. ASTM C207 – Specification for Hydrated Lime for Masonry Purposes
7. ASTM C270 – Specification for Mortar for Unit Masonry
8. ASTM C404 – Specification for Aggregates for Masonry Grout
9. ASTM C476 – Specification for Grout for Masonry
10. ASTM C1019 – Method of Sampling and Testing Grout
11. ASTM C1142 – Specification of Ready Mixed Mortar for Unit Masonry
12. ASTM C1329 – Specification for Mortar Cement

B. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specification for Cold Weather Masonry Construction

C. IMIAC: Recommended Practices and Guide Specification for Hot Weather Masonry Construction

D. OSSC (Oregon Structural Specialty Code) 2010

1. OSSC Chapter 14 – Exterior Walls
2. OSSC Chapter 21 – Masonry

1.04 SUBMITTALS

A. Submit manufacturer's recommendations, product data, and test reports.

B. Submit Mortar Mix design.

C. Submit certificate that certifies ready-mixed or other mortar used conforms to these specifications.

D. Submit test reports on grout indicating conformance of component grout materials to requirements of UBC Standard 21-19, and test and evaluation reports to requirements of OSSC Standard 2103.12.

E. Submit test reports for mortar/grout materials indicating conformance to ASTM C270 and C476 property specifications.

1.05 QUALITY ASSURANCE

A. Blend cementitious materials, aggregate and admixtures in the factory under controlled conditions, which requires only the addition of water at the project site.

B. Use approved mix designs as long as aggregate characteristics remain unchanged. Upon significant changes in aggregate, prepare new mix designs and submit to Engineer.

C. Comply with ACI 530.1/ASCE 6 "Specifications for Masonry Structures" except as otherwise noted.

D. Review installation procedures and coordinate with other work that must be integrated with masonry.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver bulk, dry-blended ingredients to project site in enclosed containers on pallets sufficiently covered to keep dry.

B. Store mortar and grout mix in accordance with manufacturer's printed instructions to prevent contamination by extraneous chemicals.

C. Maintain packaged materials clean, dry, and protected against dampness and foreign matter.

D. Provide preblended mortar and grout mix manufacturer's recommended dispensing equipment for storage and controlled dispensing of mixtures.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Comply with IMIAC cold and hot weather requirements. When ambient air temperature is below 40°F, heat mixing water to maintain mortar temperature between 40° and 120°F until placed.

B. Deliver products in reusable packages when possible. Return or recycle empty packaging.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Mutual Materials DesignMix, or approved equal.

2.02 MATERIALS

A. Portland Cement: ASTM C150, Type I or II; gray color. Fly ash, slag and pozzolans are not permitted. Do not use masonry cement mortars.

B. Mortar Cement: UBC Standard 21-14, Mortar Cement

C. Mortar Aggregates: ASTM C144, standard masonry type; clean, dry, protected against dampness, freezing and foreign matter.

D. Grout Aggregates: ASTM C404; maximum coarse aggregate size 3/8-inch. Blast furnace slag is not permitted.

E. Hydrated Lime: ASTM C207, Type S for masonry purposes. Do not use Type N.

F. Admixtures: WR Grace DryBlock, Sika Grout Aid.

G. Water: Potable.

2.03 MORTAR

A. Weigh dry mortar mix materials, including cementitious material, aggregate and admixtures, if approved, in a factory, under controlled conditions. Factory dry and preblend mortar ingredients.

B. Select proportions to produce workability and to provide optimum bond strength. Mix shall include the integral water repellant DryBlock or equivalent. Use as much lime as practical.

C. Mortar shall conform to the minimum property requirements given in Table II of ASTM C270, based on 28-day laboratory testing only. Mortar shall be Type 'S', 1800 psi for load-bearing walls above grade. Natural color. By volume (cementitious materials): I part Portland cement, ¼ to ½ part hydrated lime, with sand 2¼ to 3 times the sum of the volume of cement and lime.

D. Thoroughly mix, in quantities needed for immediate use. Mix mortar and grout for a period of time not less than 5 minutes or more than 10 minutes in a mechanical mixer with the amount of water required for the desired workability.

E. Add only clean, potable water at the project site. Slump 5 to 8-inches.

F. Use a batch type mixer in accordance with ASTM C270, subparagraph 6.3.

G. Use mortar within 2½ hours of mixing. Retempering is allowed in accordance with ASTM C270, subparagraph 6.4.

2.04 GROUT

A. Mix grout in accordance with ASTM C476 and ACI 530.1. Do not use anti-freeze compounds to lower the freezing point of grout. Proportion grout according to Table 2103.12 of OSSC.

B. Mix dry materials utilizing equipment designed to ensure uniform blending, and precision measuring devices to ensure uniformity from batch to batch. Mix may include Sika Grout Aid per manufacturer's recommendations.

C. Add only clean, potable water at the project site.

D. Thoroughly mix, in quantities needed for immediate use. Mix mortar and grout for a period of time not less than 5 minutes or more than 10 minutes in a mechanical mixer with the amount of water required for the desired workability.

E. Use grout within 1½ hours after the initial mixing water has been added to the dry ingredients.

F. Grout Fill: Provide grout at CMU bond beams, lintels, and reinforced cells.

G. Compressive Strength: 2000 psi minimum at 28-days, determined in accordance with ASTM C1019.

H. Slump: 8-inches minimum, 10-inches maximum measured in accordance with ASTM C143.

I. Use coarse grout when grout space is equal to or greater than 4-inches in both directions. Use fine grout when grout space is smaller than 4-inches in either direction.

2.05 SOURCE QUALITY CONTROL

A. Maintain documentation of compliance to mix design. Keep a digital printout displaying the proper proportioning per batch as a permanent record. Deliver printout to Engineer and Owner.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances and other specific conditions, and miscellaneous conditions affecting the performance of CMU.

B. Examine rough-in and built-in construction to verify actual locations of piping and other penetrations prior to installation.

3.02 INSTALLATION

A. Maintain an ambient temperature of the materials in contact with the mortar, of not less than 40°F. Follow IMIAC and OSSC instructions.

B. Lay hollow CMU with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings/slab and where adjacent to cells or cavities to be reinforced or filled with grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

C. Maintain consistent 3/8-inch joints.

D. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units that have been set in position. If adjustment are required, remove units, clean off mortar and reset in fresh mortar.

E. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure. Place carefully to avoid segregation of the grout materials. Do not allow coarse grout to fall more than 4-feet. Do not allow fine grout to fall more than 8-feet.

3.03 FIELD QUALITY CONTROL

A. Follow ACI 530.1 Testing and Laboratory Services.

B. Contractor shall hire an approved independent testing agency to take samples, perform tests, and submit results to Engineer. Tests shall show compliance with applicable specifications.

C. Mortar and grout samples shall be taken once every two weeks and additionally whenever mix design changes. Initial samples shall be taken during the first day of placement to ensure compliance before work progresses further.

D. Owner reserves the right to reject materials not in compliance with specifications and require the defective materials to be removed and replaced until compliance is achieved. No additional compensation will occur and contractor will promptly correct defective work.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT – Schedule I Pump Station No. 4 Replacement

A. Cost for work and materials in this Section shall be included as a portion of the lump sum bid

amount for the Project as stated on the Bid Form. No separate measurement for work in this Section will occur

END OF SECTION

SECTION 04220 - CONCRETE MASONRY UNITS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide concrete masonry units (concrete block), reinforcement, flashing, weepholes, and accessories for complete installation of CMU walls.

B. Install steel reinforcing bars where shown.

C. Fill all cells containing steel reinforcing full with grout. Fill all other cells with specified insulation material.

D. Build-in work of other trades and coordinate with others as required.

1.02 RELATED SECTIONS

A. Section 04065 – Masonry Mortar and Grout

B. Section 07410 - Metal Roof Panels and Flashing

C. Section 07920 - Joint Sealers

D. Section 03200 – Concrete Reinforcement

1.03 REFERENCES

A. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement, most recent.

B. ASTM A 153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, most recent.

C. ASTM A 615 -Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, most recent.

D. NCMA-TEK 72 – Bracing CMU Walls During Construction

E. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units, most recent.

F. ASTM C 476 – Grout for Reinforced and Non-Reinforced Masonry

G. ASTM C 270 – Mortar for Unit Masonry

H. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

I. Oregon Structural Specialty Code (OSSC) 2010.

1.04 SUBMITTALS

A. Submit to engineer for approval sufficiently early to avoid delays.

B. Manufacturer's Data: complete description of each type of unit product and accessory.

C. Certificate of Materials: Prior to delivery of materials to jobsite, submit certification from manufacturer showing compliance for specification of CMU. Certify compliance with ASTM C90. Certify mortar and grout compliance.

1.05 QUALITY ASSURANCE

A. Contractor shall have at least 5-years experience, regularly engaged in masonry work.

B. Continuous active supervisory mason-foreman in attendance while masonry work is in progress.

C. Provide CMU test results per ASTM C140 for production run to be used.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store concrete masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Do not use reinforcing or anchors having excessive rust or foreign coatings.

C. Do not use units with chips, cracks, voids, or materials that may cause staining.

D. Protect stored CMU from water absorption.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: Comply with recommendations of IMIAWC (CW).

B. Hot Weather Requirements: Comply with recommendations of IMIAWC (HW).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide concrete masonry units from one manufacturer, of uniform texture and color. Submit manufacturer's data for approval. Mutual Materials, Oldcastle, Willamette Graystone, or approved equal.

2.02 CONCRETE MASONRY UNITS

A. Concrete Masonry Units (CMU):

1. Load-Bearing Units: ASTM C90-00, Grade N; light gray, high strength concrete with net area compressive strength of 2000 psi; manufactured with integral water repellent (Dry Block by WR Grace or equivalent). Block shall also meet UBC Standard 21-4.

2. Size: Standard units with nominal face dimensions of 8 x 16 inches and 8-inch nominal depths. Cells containing reinforcement shall be a minimum of 2.5-inches wide and 4-inches long.

3. Block Density: at least 115 pcf.

4. Shrinkage: CMU shall not exceed 0.06% linear shrinkage in accordance with ASTM C90.

5. Type: Smooth-Cast (unscored) and single-side Split Face blocks required. Use smooth and textured wall corners as required. Use solid-top blocks at bottom of window openings.

6. Obtain CMU from one manufacturer, of uniform texture and color for each kind required, for each continuous area and visually related areas.

2.03 MORTAR AND GROUT MATERIALS

A. Mortar: As specified in Section 04065.

B. Grout: As specified in Section 04065.

2.04 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: ASTM A 615 Grade 60 deformed billet bars. Clean and new.

B. Single Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

2.05 FLASHINGS

A. Stainless steel drip edges. Stainless steel or EPDM flashings. Stainless steel interior termination angles. Stainless Steel minimum thickness of 0.01-inch.

C. Lap Sealant: Type as recommended by Sealant Manufacturer.

2.06 ACCESSORIES

A. Preformed Control Joints: Rubber, neoprene, or polyvinyl chloride material; provide with corner and tee accessories, fused joints.

B. Building Paper: ASTM D 226, Type I ("No. 15") asphalt felt.

C. Insulation: Korfil Block Insulation or loose fill Perlite in all un-grouted concrete masonry unit cells forming the exterior envelope.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive concrete unit masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

D. Ensure that reinforcing is clean and free from rust.

E. Ensure all surfaces to receive mortar are clean.

3.02 PREPARATION

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: as shown in the drawings.
2. Coursing: One unit plus one horizontal joint equals 8 inches.
3. Mortar Joints: Concave tooled.

3.03 LAYING MASONRY UNITS

A. Prior to grouting, the grout space shall be completely clean so that all spaces to be filled with grout do not contain mortar projections greater than ½-inch, mortar droppings or other foreign material. Grout shall be placed so that all spaces designated to be grouted shall be filled with grout and the grout shall be confined to those specific spaces. Grout pours shall be limited to 5-feet in height.

B. Lay hollow masonry units with face shell bedding on head and bed joints. All head and bed joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the shell. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

C. Remove excess mortar as work progresses. Mortar fins shall be minimized and prevented from separating and falling into the cell.

D. Interlock intersections and external corners, except for units laid in stack bond.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

G. Spread mortar bed joints to a uniform thickness with fresh mortar. Do not throw mortar scrapings or slushing mortar into joints. Excessive furrowing of bed joints will not be permitted.

H. Tool joints smooth, dense and slightly concave.

I. Joint dimension shall be 3/8-inch +/- 1/8-inch. Vertical joints shall fall on the centerline of the unit below.

J. Lay masonry units plumb, true to line, and with accurately spaced level courses. Maximum variation from plumb and plan is ¼-inch in 10 feet.

K. Install bond beam where shown on the drawings using bond beam units. Reinforce as shown and fill with grout. Lap horizontal and vertical reinforcement 30 diameters or 18-inches whichever is greater.

L. Where bond beams are used for lintels, extend at least 24-inches or 40 bar diameters, whichever is greater, past the opening.

M. Place rebar positioners to hold vertical reinforcement away from CMU cell walls.

N. Provide weep holes (0.1 to 0.2 square inches) 32-inches on center in bottom course head joint immediately above the base flashing. Provide screening or other means to prevent Perlite

insulation from displacing through weep holes.

O. Cells with reinforcement shall be grouted full. All other cells shall be filled with insulation.

P. Use smooth blocks at bottom course, top course, and course above window and door openings. All other courses to be one textured face split face with smooth side to the interior of building.

Q. When grouting is stopped for one hour or longer, horizontal construction joints shall be formed by stopping the pour of grout not less than ½-inch below the top of the uppermost unit grouted. Clean exposed surface of loose material prior to restarting pour.

3.04 REINFORCEMENT AND ANCHORAGE

A. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend reinforcement a minimum of 24-inches beyond each side of opening.

B. Place continuous joint reinforcement in first and second joint below top of walls.

C. Place reinforcing bars as indicated on drawings. Support and secure bars from displacement; maintain within ½-inch of dimensioned position.

D. Reinforcing shall be secured against displacement prior to grouting by wire positioners or other suitable devices at intervals not to exceed 200 bar diameters.

3.05 FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan. At interior exposed locations, turn up 1-inch to form pan.
2. Remove or cover protrusions or sharp edges that could puncture flashings.
3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings through exterior face of masonry and turn down to form drip. When EPDM is used as flashing, provide stainless steel drip edge at exterior.

C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.06 ADJUSTING AND CLEANING

A. Remove excess mortar and mortar smears as work progresses; replace defective mortar with mortar matching adjacent work.

B. Clean soiled surfaces with cleaning solution, using non-metallic tools. Ensure solution compatibility with painting requirements.

C. At end of each days work, and after final pointing, clean all exposed masonry by dry brushing. Protect walls overnight during inclement weather.

3.07 PAINTING

A. Paint block per Division 9.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT – Schedule I Pump Station No. 4 Replacement

A. Cost for work and materials in this Section shall be included as a portion of the lump sum bid amount for the Project as stated on the Bid Form. No separate measurement for work in this Section will occur

END OF SECTION

DIVISION 5- METALS
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SECTION 05080 – HOT-DIP ZINC COATING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Specifications for applying protective coating to structural metals, anchor bolts, fasteners, and other metal hardware.

1.02 DESIGN REQUIREMENTS

A. As specified herein.

1.03 REFERENCES

A.	ASTM A123-89	Zinc (hot-dip galvanized) Coatings on Iron and Steel Products
B.	ASTM A143-74	Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
C.	ASTM A153-82	Zinc Coating (hot-dip) on Iron and Steel Hardware
D.	ASTM A384-76	Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
E.	ASTM A385-80	Providing High-Quality Zinc Coatings (hot-dip)
F.	ASTM A780-80	Repair of Damaged Hot-Dip Galvanized Coatings
G	MILSPEC DOD-P-21035-78	Paint, High Zinc Dust Content, Galvanizing Repair

1.04 SUBMITTALS

A. Manufacturer's product data showing conformance to specified product.

B. Manufacturer's recommendation for application of zinc dust-zinc oxide coating.

C. Coating applicator's Certificate of Compliance that the hot-dip galvanized coating meets or exceeds the specified requirements.

1.05 QUALITY ASSURANCE

A. Coating systems to protect components from corrosion and other environmental degradation. System shall result in a consistent product in quality and appearance.

1.06 DELIVERY, STORAGE AND HANDLING

A. Manufactured materials shall be delivered in original, unbroken packages bearing the label of the manufacturer.

B. All materials shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

PART 2 PRODUCTS

2.01 Zinc Oxide Coating Systems

A. Zinc coating material shall be as specified in ASTM A153.

B. Zinc dust-zinc oxide coating shall conform to MILSPEC DOD-P-21035. Coating shall be as manufactured by Z. R. C. Chemical Products, Galvicon Company or approved equal.

C. Coating weights shall conform to ASTM A123 or Table 1 of ASTM A153, as appropriate.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Steel members, fabrications and assemblies shall be galvanized after fabrication in accordance with ASTM A123.

B. Anchor bolts and nuts shall be stainless steel unless noted otherwise.

C. Where zinc coating has been damaged after installation, substrate surface shall be first cleaned and then repaired with zinc dust-zinc oxide coating in accordance with ASTM A780. Coating shall consist of multiple coats to dry film thickness of eight (8) mils.

D. Items not physically damaged, but which have insufficient or deteriorating zinc coatings, and items damaged in shipment or prior to installation, shall be removed from the project site for repair by the hot-dip zinc coating method.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Hot-Dip Zinc Coating in the Section shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. No separate measurement or payment will be made for these quantities and items.

B. Schedule II – Sewer Pipe and Forcemain

1. Payment for Hot-Dip Zinc Coating in this Section shall be included within the respective unit prices for each type of pipe, manholes, services and associated appurtenance items. No separate measurement or payment will be made for these quantities and items.

END OF SECTION

SECTION 05090 – ANCHOR BOLTS AND FASTENERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section shall include furnishing and installing anchor bolts, screws, and other fasteners, complete with washers and nuts as shown on the Plans or specified or as required for proper anchorage of equipment and materials.

1.02 DESIGN REQUIREMENTS

A. Fasteners and bolts shall have sufficient strength for the intended location and use. Equipment anchorage fasteners shall be included in a code approved published report (ie. ICBO Evaluation Report, or ICC ER) showing tested strength values and compliance with current IBC.

1.03 REFERENCES

A.	ASTM A58.1-82	Minimum Design Loads for Buildings and Other Structures
B.	ASTM A36/A36M-89	Structural Steel
C.	ASTM A307-90	Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
D.	ASTM A320-A320M-88	Alloy-Steel Bolting Materials for Low Temperature Service
E.	IBC	International Building Code, Latest Edition
F.	ICBO	International Conference of Building Officials
G.	ICC-ES	ICC Evaluation Service, Inc.

1.04 SUBMITTALS

A. Manufacturer's product data showing conformance to specified product requirements.

B. Data indicating load capacities, chemical resistance, and temperature limitations.

C. Installation instructions

D. Evaluation report from ICC-ES for the particular brand of anchors to be used showing load capacities and compliance with the 2006 IBC.

PART 2 PRODUCTS

2.01 General

A. All anchor bolts and fasteners shall be stainless steel unless noted otherwise.

C. Anchor bolt holes in equipment support frames shall not exceed the bolt diameters by more than 15 percent, up to a limiting maximum oversizing of 1/8-inch. Unless otherwise specified, or shown in the drawings, minimum anchor bolt diameter shall be ½ inch.

D. Tapered washers shall be provided where mating surface is not square with the nut. Flat washers required all other places. Nuts and washers shall be same material as bolts.

2.02 Bolts, Nuts, Washers

A. Bolts. ASTM A320, Type 304 or 316, Stainless Steel, B8 or B8M Class 1 or 2

B. Nuts and Washers. ASTM A194, Grade 8, 304 or 316 stainless steel.

2.03 Wedge-Type Mechanical Anchor Bolts (Into Solid Concrete)

A. Wedge anchors shall have a stainless steel split expansion ring and a threaded stud bolt body and integral cone expander, nut and washer. Anchor bodies, nuts, and washers shall be type 304 or 316 stainless steel.

B. The exposed end of the anchor shall be stamped to identify anchor length. Stampings should be preserved during installation for any subsequent embedment verification.

C. Anchors shall be tested to ASTM E488 criteria and listed by ICC (formerly ICBO).

D. Approved products include: ITW Red Head Trubolt; Hilti Kwik Bolt 3; or approved equal.

2.04 Sleeve-Type Mechanical Anchor Bolts (Into Hollow Concrete Block)

A. Sleeve type anchors with split expansion sleeve over a threaded stud bolt body and integral expander, nut and washer. Anchor bodies, nuts, and washers shall be type 304, 316, or 18-8 stainless steel.

B. The exposed end of the anchor shall be stamped to identify anchor length. Stampings should be preserved during installation for any subsequent embedment verification.

C. Anchors shall be tested to ASTM E488 criteria and listed by ICC (formerly ICBO).

D. Approved products include: ITW Red Head Dynabolt; Hilti HLC Sleeve Anchor; or approved equal.

2.05 Adhesive Anchor Bolts

A. Threaded Rod. ASTM F-593 CW stainless steel threaded rod, type 304 or 316. Nuts shall be stainless steel conforming to ASTM F-594. Washers shall be stainless steel conforming to ASTM A-240, AISA 304, and ANSI B18.22.1. Rod to have a minimum yield strength (f_y) of 65,000 psi in 3/8" to 5/8" diameter and 45,000 psi in 3/4" to 1-1/4" diameter.

B. Where exposed to potable water (tank interiors, etc.), adhesive shall be listed as compliant with NSF/ANSI Standard 61.

C. Epoxy Adhesive. Two component, 100% solid (no solvents), non-sag paste, insensitive to moisture. Meets ASTM C881-90, Type IV, Grade 3, Class A, B, and C with the exception of gel time. Shrinkage during cure per ASTM D2566: .00051 in./in. maximum. Compressive strength, ASTM D695: 10,300 psi minimum. Water solubility: None. Heat deflection temperature, ASTM D648: 140°F minimum.

D. Approved products include: Threaded Rod – Hilti HAS Stainless Steel or approved equal; Adhesives – ITW Red Head C6; Hilti HIT RE 500; or approved equal.

2.06 Lag Bolts/Screws

A. Hex head 18-8 or 304 stainless steel with washers.

2.07 Toggle Bolts

A. Use only where lag screws cannot be secured to wood wall studs.

2.08 Nails

A. All nails used shall be hot-dip galvanized.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Expansion, wedge or adhesive anchors set in holes drilled in the concrete after the concrete is placed will not be permitted in substitution for cast-in-place anchor bolts except where otherwise specified. Upset threads shall not be acceptable.

B. Fieldwork, including cutting and threading, shall not be permitted on galvanized items. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or phenolic washers.

C. Use carbide tipped hammer drill bits made in accordance to ANSI B212.15-1994 to install anchors.

D. Cast In-Place Anchor Bolts

1. Anchor bolts to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if specified, recesses or blockouts shall be formed in the concrete and the metalwork shall be grouted in place.

2. After anchor bolts have been embedded, their threads shall be protected by grease and the nuts run on.

E. Adhesive Anchor Bolts

1. Use of adhesive or capsule anchors shall be subject to the following conditions:

a. Use shall be limited to locations where exposure, on an intermittent or continuous basis, to acid concentrations higher than 10 percent, or to machine or diesel oils, is extremely unlikely.

b. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above 120 degrees F. is extremely unlikely. Overhead applications (such as pipe supports) because of the above concerns, shall be disallowed.

c. Approval from Engineer for specific application and from supplier of equipment to be anchored, if applicable.

d. Anchor diameter and grade of steel shall be per Contract Documents or per equipment supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease and oils.

e. Embedment depth shall be as specified. Adhesive capsules of different diameters may be used to obtain proper volume for the embedment, but no more than two (2) capsules per anchor may be used. When installing different diameter capsules in the same hole, the larger diameter capsule shall be installed first. Any extension or protrusion of the capsule from the hole is prohibited.

f. All installation recommendations by the anchor system manufacturer shall be followed carefully, including maximum hole diameter.

g. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill.

h. Holes shall be blown clean with compressed air and be free of dust or standing water prior to installation.

i. Anchor shall be left undisturbed and unloaded for full adhesive curing period.

j. Concrete temperature (not air temperature) shall be compatible with curing requirements of adhesives per adhesive manufacturer.

F. Expansion Anchors

1. Use of expansion or wedge type anchors shall be subject to same conditions in as epoxy (adhesive) anchors as applicable.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for Anchor Bolts and Fasteners in the Section shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. No separate measurement or payment will be made for these quantities and items.

B. Schedule II – Sewer Pipe and Forcemain

a. Payment for Anchor Bolts and Fasteners in this Section shall be included within the respective unit prices for each type of pipe, manholes, services and associated appurtenance items. No separate measurement or payment will be made for these quantities and items.

END OF SECTION

SECTION 05095 – METAL ARCHITECTURAL PRODUCTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section shall include furnishing and installing column bases, beam hangers, beam to column ties, and other architectural products, complete with fasteners as shown on the Plans or specified or as required for proper anchorage of equipment and materials.

1.02 DESIGN REQUIREMENTS

A. Architectural products and fasteners shall have sufficient strength for the intended location and use.

1.03 SUBMITTALS

A. Manufacturer's product data showing conformance to specified product requirements.

B. Data indicating load capacities, fastening requirements and coating information.

C. Installation instructions.

PART 2 PRODUCTS

2.01 General

A. All architectural products shall be galvanized or flat black powder coated steel unless noted otherwise.

2.02 Beam to Column Tie

A. Minimum 3/8" steel construction.

B. Minimum dimensions: 10" wide x 7" deep

C. Minimum 3/4" diameter bolt holes, 4 per tie

D. Minimum 20,000 pounds bearing load.

E. Ties shall be embedded into concrete column with a minimum of three (3) #6 rebar ties.

F. Simpson Strong Tie HGLBC; or equal.

2.03 Hurricane ties

A. Install Contractor's choice of tie which meets OSSC 2010 code requirements.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Install in accordance with manufacturer's instructions. Follow code requirements for product and installation.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for Metal Architectural Products in the Section shall be included within the lump sum basis for the amount stated on the Bid Form for the Project. No separate measurement or payment will be made for these quantities and items.

END OF SECTION

SECTION 05430 – SLOTTED CHANNEL FRAMING (STRUT SYSTEMS)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Continuous slot, bolted metal framing channels and all associated fittings and hardware.

B. Trapeze type supports for cable tray, conduit, pipe and other similar systems.

C. Use of bolted metal framing as a surface metal raceway.

1.02 REFERENCES

A. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

B. ASTM A653 - General Requirements for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process

C. ASTM A1011 - Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formablility *(Formerly ASTM A570)*

D. ASTM F1136 – Standard Specification for Chromium/Zinc Corrosion Protective Coatings for Fasteners

E. ASTM A907 - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot-Rolled, Structural Quality

F. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel

G. MFMA - Metal Framing Manufactureres Association

H. ANSI/NFPA 70– National Fire Protection Association (National Electrical Code)

I. AISI - American Iron and Steel Institute

1.03 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in the manufacture of bolted metal framing of the types required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. MFMA Compliance: Comply with the latest revision of MFMA Standards Publication Number MFMA-3, "Metal Framing Standards Publication".

C. NEC Compliance: Comply with the latest revision NFPA 70 - Article 352 "Surface Metal Raceways and Surface Nonmetallic Raceways".

D. UL Compliance: Comply with UL "Standard for Surface Metal Raceway and Fittings", UL 5.

E. Bolted framing channels and fittings shall have the manufacturers name, part number, and material heat code identification number stamped in the part itself for identification.

Material certification sheets and test reports must be made available by the manufacturer upon request.

F. Stainless steel bolted framing parts shall be stamped to identify the material. Material certification sheets and test reports must be made available by the manufacturer upon request.

1.04 SUBMITTALS

A. Submit drawings of strut and accessories including clamps, brackets, hanger rods, and fittings.

B. Submit manufacturer's product data on strut channels including, but not limited to, types, materials, finishes, gauge thickness, and hole patterns. For each different strut cross-section, submit cross sectional properties including Section Modulus (S_X) and Moment of Inertia (I_X).

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver strut systems and components carefully to avoid breakage, denting, and scoring finishes. Do not install damaged equipment.

B. Store strut systems and components in original cartons and in clean dry space; protect from weather and construction traffic.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with these specifications, strut systems to be installed shall be as manufactured by Cooper B-Line, Inc.; Unistrut; or engineer approved equal.

2.02 STRUT CHANNELS AND COMPONENTS

A. General: Strut shall be 1-5/8 x 1-5/8 inches x 12 gauge in varying heights and welded combinations as required to meet load capacities and designs indicated on the drawings.

B. Materials and Finish: Material and finish specifications shall meet one of the following:

1. Epoxy Painted: Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS Grade 33, then painted with green water born epoxy applied by a cathodic electro-deposition process. Fittings shall be manufactured from steel meeting the minimum requirements of ASTM A907 SS, Grade 33, and epoxy painted or hot-dip galvanized. All hardware shall be stainless steel Type 304 or Type 316.

2. Hot-dip Galvanized Steel: Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 and shall be hot-dip galvanized after fabrication in accordance with ASTM A123. Fittings shall be manufactured from steel meeting the minimum requirements of ASTM A907 SS, Grade 33, and hot-dip galvanized after fabrication in accordance with ASTM A123. All hardware shall be stainless steel Type 304 or Type 316. All hot-dip galvanized after fabrication products must be returned to point of manufacture after coating for inspection and removal of all sharp burrs.

3. Stainless Steel: All strut, fittings and hardware shall be made of AISI Type 304 or type 316 stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install strut in accordance with MFMA-102 'Guidelines for the Use of Metal Framing'; in accordance with equipment manufacturer's recommendations, and with recognized industry practices.

B. All nuts and bolts shall be tightened to the following values or as recommended by manufacturer.

Bolt Size	Torque (ft-lbs)
1/4 - 20	6
5/16 - 18	11
3/8 - 16	19
1/2 - 13	50

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

a. Payment for Slotted Channel Framing and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

DIVISION 6- WOOD
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SECTION 06100 – ROUGH CARPENTRY

PART 1 GENERAL

1.01 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The most recently issued codes and publications shall apply.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B18.6.1	(1981; R 1997) Wood Screws (Inch Series)

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA E30	(1996) Design/ Construction Guide, Residential and Commercial

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A307	(2000) Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A563	Standard Specification for Carbon and Alloy Steel Nuts

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)

AWPA C1	(1996) All Timber Products – Preservative Treatment by Pressure Processes
AWPA C2	(1996) Lumber, Timber, Bridge Ties and Mine Ties - Preservative Treatment by Pressure Processes
AWPA C9	(1996) Plywood - Preservative Treatment by Pressure Processes
AWPA M2	(1996) Inspection of Treated Wood Products
AWPA M6	(1996) Brands Used on Forest Products

FEDERAL SPECIFICATIONS (FS)

FS FF-B-588	(Rev. E) Bolt, Toggle: and Expansion Sleeve, Screw
FS FF-N-105	(Rev. B) (Int Amd. 4) Nails, Brads, Staples and Spikes: Wire, Cut and Wrought
FS FF-S-325	(Int Amd. 3) Shield, Expansion, Nail Expansion, and Nail, Drive Screw (Devices, Anchoring, Masonry)
FS FF-W-92	Flat Washers

OREGON STRUCTURAL SPECIALTY CODE (OSSC)

OSSC	(2010) Oregon Structural Specialty Code

U. S. DEPARTMENT OF COMMERCE, TECHNOLOGY ADMINISTRATION
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

PS 1	(1995) Construction and Industrial Plywood
PS 2	(1992) Performance Standard for Wood-Based Structural-Use Panels
PS 20	(1999) American Softwood Lumber Standard

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17	(1996; Supp. VII and VIII) Standard Grading and Dressing Rules for Douglas Fir, Western Hemlock, Western Red Cedar, White Fir, Sitka Spruce Lumber

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA GRWL	1983 Western Woods Use Book - Chapter III – WWPA Grading Rules for Western Lumber

NATIONAL FOREST PRODUCTS ASSOCIATION (NFOPA)

NFOPA-03	(1988) Manual for House Framing

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01300, Submittals:

1. SD-07, Certificates – Certificates of grade

2. SD-11, Factory Test Reports – Preservative-treated lumber and plywood

1.03 DELIVERY AND STORAGE

A. Deliver materials to the site in an undamaged condition.

B. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness.

C. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Remove defective and damaged materials and provide new materials.

1.04 GRADING AND MARKING

A. Lumber – Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used.

B. Plywood – Mark each sheet with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. The

mark shall identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with PS-1.

C. Preservative-Treated Lumber and Plywood – The Contractor shall be responsible for the quality of treated wood products. Each treated piece shall be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The AWPB Quality Mark "LP-2" or LP-22" on each piece also will be accepted as evidence of compliance with applicable AWPA treatment standards.

1.05 SIZES AND SURFACING

A. Comply with PS-20 for dressed sizes of yard lumber. Lumber shall be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which the product is produced.

1.06 MOISTURE CONTENT

A. Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products shall be as follows at the time of delivery to the job site:

1. Framing lumber and boards - 19 percent maximum

2. Materials other than lumber - Moisture content shall be in accordance with standard under which the product is produced

1.07 PRESERVATIVE TREATMENT

A. Treat lumber and timber in accordance with AWPA C1 and AWPA C2, and plywood in accordance with AWPA C1 and AWPA C9. All wood shall be air or kiln dried after treatment. Specific treatments shall be verified by the report of an approved independent inspection agency, or the AWPA Quality Mark on each piece. Do not incise surfaces of lumber that will be exposed. Brush coat areas that are cut or drilled after treatment with either the same preservative used in the treatment or with a 2 percent copper naphthenate solution. The following items shall be preservative treated:

1. Wood framing, blocking, and plywood
2. Wood sills, soles, plates, furring, and sleepers, furring and nailers that are set into or in contact with concrete or masonry.
3. Nailers, edge strips, crickets, curbs, and cants for roof decks.

1.08 QUALITY ASSURANCE

A. Certificates of Grade – Submit certificates attesting that products meet the grade requirements specified in lieu of grade markings where appearance is important and grade marks will deface material.

PART 2 PRODUCTS

2.01 WOOD MATERIALS

A. Framing lumber, cant strips, sleepers, furring, sub-fascias, nailing strips, and nailers and board lumber such as subflooring and wall and roof sheathing shall be one of the species listed in the table below. Minimum grade of species shall be as listed.

B. Table of Grades for Framing and Board Lumber

Grading Rules	Species	Framing	Board Lumber
WWPA WLGR Standard grading rules	Douglas Fir-Larch Douglas Fir South Hem-Fir Ponderosa Pine – Sugar Pine Ponderosa Pine – Lodgepole Pine Subalpine Fir White Woods	All Species: Standard Light Framing or No. 3 Structural Light Framing 2x4 nominal size, (Stud Grade for 10-ft and shorter)	All Species: No. 3 Common
WCLIB 17 Standard grading rules	Douglas Fir-Larch Hem-Fir	All Species: Standard Light or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10-ft and shorter)	All Species: Standard

C. Plywood Sheathing – Unless specified otherwise, Plywood sheathing shall be tongue-and-groove exterior grade sheathing, 5/8-inch minimum thickness, grade stamped "C-C Ext-DFPA," and manufactured in accordance with NIST PS 1, Group 1.

2.02 ANCHORAGE AND FASTENER MATERIALS

A. Nails and Staples – Nails, staples, and tacks shall conform to FS FF-N-105. Nails for fastening interior wood partitions or rough framing shall be steel wire nails. Nails for roof blocking, cants, and nailers shall be galvanized. Nails used to fasten exposed wood fascias or finished wood members exposed to the weather shall be aluminum alloy or galvanized finishing nails. Power-driven staples shall be galvanized Type III, Style 3.

B. Bolts, Nuts and Screws – Bolts, including non-headed anchor bolts, shall be carbon steel, galvanized, conforming to ASTM A307, Grade A. Nuts shall be carbon steel, galvanized, conforming to ASTM A563. Wood screws shall be carbon steel, galvanized, conforming to ANSI B18.6.1. Expansion shields, expansion nails, and drive screw devices shall conform to FS FF-S-325. Toggle bolts shall conform to FS FF-B-588. Washers shall be carbon steel, galvanized, general assembly purpose type, conforming to FS FF-W-92, Type A, Grade I, Class A.

C. Bar or Strap Anchors – Bar or strap anchors shall be steel conforming to ASTM A36/A36M. Hot-dip galvanized coating shall be in accordance with ASTM A525, G90.

PART 3 EXECUTION

3.01 INSTALLATION

A. General – Members shall be framed for the passage of ducts and pipes and shall not be cut, notched, or bored more than one quarter of their depth without approved reinforcement. Washers shall be provided under bolt heads or nuts in contact with wood. Lumber shall be bored to receive bolts. Nailers, blocking, and furring shall be furnished in lengths that minimize joints.

B. Interior Wood Partitions – Wood partitions shall be framed with 2x4 studs spaced 16 inches on center, unless otherwise indicated. Framing shall be closely fitted, accurately constructed to true plane lines and levels, and rigidly secured in place in conformance with NFOPA-03. Partition plates shall be secured to concrete floor with anchor bolts, expansion sleeves, and lag bolts. Powder-driven fasteners may be used. One anchor shall be provided near each end of the partition plate and at intermediate intervals at a maximum spacing of 4 feet on center. Studs shall be doubled at openings. Headers shall consist of two pieces of nominal 2-inch framing lumber set on edge and nailed together. Depth of header shall be determined in accordance with the NFOPA-03, except that the span for a header of two 2x4's shall not exceed 3 feet. Corners shall be constructed of not less than three studs. End studs of partitions abutting concrete or masonry shall be anchored thereto with 1/2-inch expansion bolts, one near each end and at intermediate maximum intervals of 4 feet, or with powder-driven threaded fasteners, same size and spacing. Rough wood bucks and frames shall be anchored to masonry and concrete with 3/16-inch by 1-1/4-inch steel straps, turned up 2 inches at ends and extending not less than 4 inches into concrete masonry units or concrete. Anchors shall be placed near top and bottom of each buck and frame and at intermediate intervals of 3-feet maximum. Partitions shall have two top plates and a single bottom plate with one continuous row of horizontal wood blocking the full width of the partition, wedged and nailed in place at mid-height. Partitions shall be framed for the installation of the facing material, trim, cabinets, plumbing, and other work. Blocking and nailers, of not less than 1x4 stock, shall be cut to fit horizontally and vertically between framing and nailed thereto to receive finished wall material. Solid blocking shall be provided at locations required for installation of wall-mounted cabinets, shelves, fixtures, and equipment.

C. Blocking, Cant Strips, and Nailers – Nailing strips, blocking, cant strips, and sub fascia wood members shall be continuous, cut with square ends and in maximum practical lengths. For bolted connections, sub-fascia members shall be fastened to concrete or concrete masonry units with 1/2-inch bolts at a maximum spacing of 4 feet on center, one bolt near each end of the member. Bolt heads shall be countersunk flush with the surface of the wood. Sub-fascia members shall be held to a tolerance of 1/8 inch in 10 feet. Wood cant strips shall be not less than 4-inches long and set at projections through the roof deck, expansion joints, and fascias. Perimeter roof blocking shall have screened holes providing a net open area equivalent to at least 10 percent of the edge face to provide ventilation for insulation.

D. Wood Furring – Furring strips shall be erected plumb and rigid, using wood shims wherever necessary to adjust the face of the furring to a true, even plane to receive finish materials. Exterior masonry walls shall be furred to receive or dry-wall finish. Furring shall be 1x3 continuous strips, 16 inches on center, installed vertically. Furring shall be secured to concrete with nailing plugs, clips, or masonry nails. Fasteners shall be provided at top and bottom and at 24 inches on center, minimum. Furring strips fastened to concrete masonry units shall be secured by toggle bolts, anchor bolts, or screw expansion sleeves.

E. Wood Sheathing – Plywood sheathing shall be of indicated thickness and installed in accordance with APA E30. Nailing shall conform to the nailing schedule per OSSC Chapter 23, unless otherwise shown on the drawings.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Rough Carpentry and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 06173 – WOOD TRUSSES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section includes all work associated with furnishing and placing prefabricated metal-plate-connected wood trusses as shown on the drawings and as indicated by the requirements of this section.

1.02 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work of this section.

1.03 RELATED SECTIONS

A. Section 06100 – Rough Carpentry

1.04 DESIGN CRITERIA

A. Trusses should be capable of withstanding design loads indicated without exceeding ANSI/TPI 1 deflection limits.

1. Where gypsum board ceilings are hung directly from trusses, limit live load deflection to 1/360th of span.

1.05 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with TPI quality-control procedures for manufacture of connector plates published in TPI 1.

1. Manufacturer's responsibilities include preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that involves inspection by SPIB, Timber Products Inspection, TPI, or other independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Comply with ANSI/TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction," and TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."

D. Wood Structural Design Standard: Comply with applicable requirements in AFPA's "National Design Specifications for Wood Construction" and its "Supplement."

1.06 SUBMITTALS

A. Submit Product Data: For metal-plate connectors, metal framing anchors, bolts, and fasteners indicated.

B. Submit Shop Drawings: Show location, pitch, span, camber, configuration, and spacing for each type of truss required; species, sizes, and stress grades of lumber; splice details;

type, size, material, finish, design values, orientation, and location of metal connector plates; and bearing details.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Submit Qualification Data for the following:

1. Metal-plate manufacturer.
2. Fabricator.

D. Research/Evaluation Reports for the following:

1. Metal-plate connectors.
2. Metal framing anchors.

1.07 DELIVERY AND STORAGE

A. Store trusses on job site in accordance with manufacturer's instructions. Provide bearing supports and bracings to prevent bending or overturning of trusses during transit and storage.

PART 2 PRODUCTS

2.01 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

B. Grade and Species: Any species for truss chord and web members, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AFPA's "National Design Specifications for Wood Construction" and its "Supplement."

2.02 METAL PRODUCTS

A. Metal Connector Plates: Fabricate connector plates to comply with ANSI/TPI 1 from hot-dip galvanized steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation; Designation SS, Grade 33, and not less than 0.036 inch (0.9 mm) thick.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Alpine Engineered Products, Inc.
b. CompuTrus, Inc.
c. Eagle Metal Products.
d. Jager Industries, Inc.
e. Mitek Industries, Inc.
f. Robbins Manufacturing Company.
g. TEE-LOK Corporation.
h. Truswal Systems Corporation.

B. Fasteners: Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

1. Nails, Wire, Brads, and Staples: FS FF-N-105.
2. Power-Driven Fasteners: CABO NER-272.
3. Wood Screws: ASME B18.6.1.
4. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).
5. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

C. Metal Framing Anchors: Provide framing anchors made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Alpine Engineered Products, Inc.
b. Cleveland Steel Specialty Co.
c. Harlen Metal Products, Inc.
d. KC Metals Products, Inc.
e. Silver Metal Products, Inc.
f. Simpson Strong-Tie Company, Inc.
g. Southeastern Metals Manufacturing Co., Inc.
h. United Steel Products Company, Inc.

2. Allowable Design Loads: Meet or exceed those indicated per manufacturer's published values determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.03 FABRICATION

A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Lifting points, as indicated, shall be used to hoist trusses into position. Exercise care to prevent out-of-plane bending of trusses.

B. Install and brace trusses according to ANSI/TPI 1 recommendations and as indicated. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

C. Anchor trusses securely at bearing points; use metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.

D. Securely connect each truss ply required for forming built-up girder trusses. Anchor trusses to girder trusses as indicated.

E. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

F. Install wood trusses within installation tolerances of ANSI/TPI 1.

G. Do not cut or remove truss members.

H. Return wood trusses that are damaged or do not meet requirements to fabricator and replace with trusses that do meet requirements.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Wood Trusses and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

DIVISION 7- THERMAL AND MOISTURE PROTECTION
TABLE OF CONTENTS

SECTION 07410 - METAL ROOF PANELS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Factory-formed Standing seam metal roofing. Metal roofing system includes:

1. Snap-On Standing Seam Panels
2. Ridge Vents
3. All related flashing, clips, and accessories as required for complete system

B. Related Sections: Section(s) related to this section include:

1. Joint Sealants: Section 07920.
2. Gutters and downspouts: Section 07715.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM E283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
4. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

B. Underwriters Laboratories, Inc. (UL):

1. UL 263 Fire Tests of Building Construction and Materials.
2. UL 580 Tests for Uplift Resistance of Roof Assemblies.
3. UL 790 Tests for Fire Resistance of Roof Covering Materials.

C. Sheet Metal and Air Conditioning Contractors National Association Inc. (SMACNA):

1. SMACNA Architectural Sheet Metal Manual.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide sheet metal roofing which has been manufactured, fabricated and installed to withstand structural and thermal movement, wind loading and weather exposure to maintain manufacturer's performance criteria without defects, damage or failure of infiltration of water.

1. Wind-Uplift: Roof panel assembly shall comply with UL 580 for UL 90 rated assemblies.
2. Static Air Infiltration: Completed roof system shall have a maximum of 0.06 cfm/sf with 6.24 psf (299 Pa) air pressure differential as per ASTM E283.
3. Water Infiltration: No evidence of water penetration at an inward static air pressure differential of not less than 6.24 psf (299 Pa) and not more than 12 psf (575 Pa) as per ASTM E331.

1.04 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1

Submittal Procedures Section.

B. Product Data: Submit product data, including manufacturer's SPEC-DATA[a] product sheet, for specified products.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors and textures.

D. Samples: Submit selection and verification samples for finishes, colors and textures. Color to be selected by Owner from manufacturer's standard color selection.

E. Quality Assurance Submittals: Submit the following:

1. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
2. Manufacturer's Instructions: Manufacturer's installation instructions.

F. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals, Maintenance Data and Operation Data Section. Include methods for maintaining installed products, precautions against cleaning materials and methods detrimental to finishes and performance.
2. Warranty: Warranty documents specified herein.
3. Record Documents: Project record documents for installed materials in accordance with Division 1 Closeout Submittals (Project Record Documents) Section.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall be experienced in performing work of this section and should have specialized in the installation of work similar to that required for this project.

1. Installer shall have successfully completed at least three (3) installations.

B. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Architectural Sheet Metal Manual.

C. Preinstallation Meetings: Conduct preinstallation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.06 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

1. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Identify fabricated components with UL 90 label where appropriate.

C. Storage and Protection: Store materials protected from exposure to harmful conditions. Store material in dry, above-ground location.

1. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture runoff.
2. Prevent contact with material that may cause corrosion, discoloration or staining.

3. Do not expose to direct sunlight or extreme heat trim material with factory applied strippable film.
4. Damaged material shall be replaced prior to installation.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements and openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.08 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

B. Warranty Required: 20-year non-prorated warranty covering material finish, including color, fade, chalking and film integrity. Commences on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SHEET METAL ROOFING

A. Manufacturer: Petersen Aluminum Corporation or engineer approved equal.

1. Contact: 1005 Tonne Road, Elk Grove Village, IL 60007; Telephone: (800) 323-1960, (847) 228-7150; Fax: (800) 722-7150; website: www.pac-clad.com.

B. PAC-CLAD Snap-On Panels:

1. Type: Standing Seam.
2. Seam Height: 1" Seam Height or 1 1/2" Seam Height.
3. Material: 24 gauge G-90 hot-dipped galvanized panel.
4. Panel Dimension: 12" to 18" oc.
5. Texture: Smooth texture.
6. Rating: UL 90 rating (Wind uplift) panel assembly.
7. Flashing and Trim: HDG Steel, 22 gauge.
8. Fasteners: Nonpenetrating clip, manufacturer's standard.

C. PAC-CLAD Flashing and Trim: Manufacturer's standard flashing and trim profiles, factory formed, gauge as recommended by manufacturer, color and finish to match metal roofing panels.

D. Substitutions: May be considered when quality and warranty are equal to specified product. Submit for approval in timely manner to avoid delays. Coordinate with Division 1.

2.02 MATERIALS

A. Galvanized Steel Sheet: ASTM A653, G90 steel sheet, zinc coated (galvanized) by hot dip process, structural quality.

1. Thickness: 24 gauge and 22 gauge as indicated.

2.03 RELATED MATERIALS

A. General: Coordinate use of related materials:

1. Underlayment: ASTM D226, Type II No. 30 asphalt saturated organic roofing felt. Two layers required.
2. Plywood Deck: 5/8" nominal thickness, exterior grade.
3. Sealants: Elastomeric joint sealants.

2.04 FABRICATION

A. General:

1. Continuous Length: Fabricate panels 40' and less in one continuous length.
2. Trim and Flashings: Fabricate trim and flashings from same material as roof system material.
3. Portable Roll Former: Panels fabricated by portable roll former shall not be approved.

2.05 FINISHES

A. PAC-CLAD Factory Applied Finish:

1. Topside: Full-strength fluoropolymer (70% Kynar 500 or Hylar 5000 resin) system of 1.0 mil total dry film thickness.
2. Underside: Wash coat of 0.3 – 0.4 mil (0.008 – 0.010 mm) dry film thickness.
3. Texture: Smooth texture, dull matte specular gloss 25% – 35% at 60°.
4. Protective Film: Strippable vinyl film applied during panel fabrication and finishing.

B. COLORS

1. Submit manufacturer's color selection samples. At least 10 colors shall be available.
2. Color will be selected by Owner.

2.06 SOURCE QUALITY

A. Source Quality: Obtain sheet metal roofing from a single manufacturer.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, recommendations and installations instructions for substrate verification, preparation requirements and installation.

1. Strippable Film: Remove manufacturer's protective film, if any, from surfaces of roofing panels.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.03 PREPARATION

A. Coordination: Coordinate metal roofing with other Work (drainage, flashing and trim, deck substrates, parapets, copings, walls) and other adjoining work to provide a noncorrosive and leakproof installation.

B. Dissimilar Metals: Prevent galvanic action of dissimilar metals.

3.04 INSTALLATION

A. General: Install metal roofing panels to profiles, patterns and drainage indicated and required for leakproof installation. Provide for structural and thermal movement of work. Seal joints for leakproof installation.

1. Seams: Provide uniform, neat seams.
2. Fasteners: Conceal fasteners in exposed work. Cover and seal fasteners and anchors for watertight and leakproof installation.
3. Sealant-Type Joints: Provide sealant-type joint where indicated. Form joints to conceal sealant. Comply with Division 7 Joint Sealants Section for sealant installation.

3.05 FIELD QUALITY REQUIREMENTS

A. Site Tests (Post-Installation Testing): Owner reserves right to perform post-installation testing of installed sheet metal roofing.

3.06 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.07 PROTECTION

A. Protection: Protect installed product from damage during construction.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Metal Roof Panels and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 07715 – ALUMINUM GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes aluminum gutters, downspouts, drop outlets, elbows, end caps, miters, supports, straps, and other accessories and finish for a complete system.

B. Also included: Installation and testing.

1.02 REFERENCES

A. American Architectural Manufacturer Association (AAMA) Specification 1405.1: *Specification for Aluminum Gutters and Downspouts.*

1.03 SYSTEM DESCRIPTION

A. Downspouts at locations as shown on the Plans. Provide all necessary downspout straps and other items for a complete installation. System shall be free from leaks.

1.04 SUBMITTALS

A. Prior to ordering, submit manufacturer's data for approval. Include material compliance information, coating system, warranty, and finish.

B. Submit manufacturer's color samples for approval by City Engineer in accordance with Section 09900- Paint and Coatings.

PART 2 PRODUCTS

2.01 MATERIAL

A. Downspout shall be produced from 3105 H26P aluminum sheet with a minimum tensile strength of 29,000 psi and minimum yield strength of 25,000 psi.

1. Downspout, Downspout Strap, and Elbow Thickness: 0.027-inch minimum

2.02 SIZE AND STYLE

A. Downspouts shall be 2-inch by 3-inch rectangular corrugated.

2.03 FINISH

A. Both sides of the aluminum sheet shall be coated with a corrosion inhibiting primer or pretreatment system and an acrylic or polyester topcoat.

B. Topcoat finish shall be available in at least 10 different colors.

2.04 RELATED MATERIALS

A. Elastomeric Joint Sealant.

PART 3 EXECUTION

3.01 INSTALLATION

A. Before starting work, verify governing dimensions at site. Clean and prepare adjacent surfaces prior to securing gutters and downspouts. Install after exterior coating is applied, coordinate with paint contractor.

B. Downspouts shall be securely fastened to building at the top and bottom with intermediate supports spaced a maximum of 10-feet apart.

C. Provide downspout elbows as required.

3.02 PROTECTION

A. Care must be exercised in placing aluminum in contact with dissimilar materials. Aluminum shall not be installed in contact with dissimilar metals, concrete, pressure treated/pretreated lumber, masonry, or corrosive non-metallic materials. Dissimilar materials shall be painted or otherwise protected before contact with aluminum or when drainage from them passes over aluminum.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Aluminum Gutters and Downspouts, and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 07920 – JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Joint Sealants for interior and exterior surfaces

B. Flexible Joint Fillers

C. Backer Rods

1.02 RELATED SECTIONS

A. Section 03300 – Cast-In-Place Concrete

B. Section 07410 – Metal Roof Panels

C. Section 07715 – Aluminum Gutters and Downspouts

1.03 REFERENCES

A. ASTM C 834 - Standard Specification for Latex Sealants.

B. ASTM C 882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

C. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.

D. ASTM C 1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

E. ASTM C 1193 – Standard Guide for Use of Joint Sealants.

F. FS (Federal Specification) A-A-1556A (formerly TT-S-00227E) - Federal Specification for Sealing Compound: Elastomeric Type, Multi-Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).

G. FS (Federal Specification) TT-S-00230C - Federal Specification for Sealing Compound: Elastomeric Type, Single Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).

H. FS (Federal Specification) TT-S-001543 - Federal Specification for Sealing Compound: Silicone Rubber Base (for Caulking, Sealing, and Glazing in Buildings and Other Structures).

I. Sealant, Waterproofing and Restoration Institute (SWRI) – Sealant and Caulking Guide Specification.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Manufacturer's Technical Data Guides and application procedures.

C. Submit samples illustrating colors selected.

D. Submit laboratory tests or data validating product compliance with performance criteria specified.

E. Submit manufacturer's statement of product compatibility with intended use, and list of recommended products for each type of joint to be sealed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company regularly engaged in manufacturing and marketing of products specified in this section.

B. Perform work in accordance with SWRI Guide Specifications and ASTM C 1193.

C. Installer Qualifications: Qualified to perform work specified by reason of experience or training provided by product manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product.

B. Store products in a location protected from freezing, damage, construction activity, precipitation, and direct sunlight in strict accordance with manufacturer's recommendations. Do not exceed product shelf-life.

C. Condition products to approximately 60 to 70 degrees F (16 to 21 degrees C) for use in accordance with manufacturer's recommendations.

D. Handle all products with appropriate precautions and care as stated on Material Safety Data Sheet.

1.07 PROJECT CONDITIONS

A. Do not use products under conditions of precipitation or freezing weather. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.

B. Ensure substrate is dry and prepared according to manufacturer's written recommendations.

C. Protect adjacent work from contamination due to mixing, handling, and application of flexible epoxy joint filler.

1.08 WARRANTY

A. Provide manufacturer's material warranty, five-years minimum.

B. Include coverage for replacement of sealant materials which fail to achieve water tight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:

1. Sonneborn
2. GE
3. Dow Corning
4. Pecora
5. Tremco
6. WR Meadows

B. Provide all joint sealers of the same type from a single manufacturer.

C. Specification uses Sonneborn product names. Submit equal products for approval.

2.02 MATERIALS

A. Single Component, Non-Sag Polyurethane Sealant: ±25% movement capability for vertical joints; ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, A, G, and O; FS TT-S-00230C, Type II, Class A; USDA approved; SWRI validated; UL classified (fire resistance). Sonneborn "Sonolastic NP 1"

B. Two Component, Non-Sag Polyurethane Sealant: ±50% movement capability for vertical joints; ASTM C 920, Type M, Grade NS, Class 25, Use NT, T, G, A, M, and O; FS TT-S-00227E, Type II, Class A; USDA approved; SWRI validated; UL classified (fire resistance). Sonneborn "Sonolastic NP 2"

C. Single Component, Self-Leveling Polyurethane Sealant: ±25% movement capability for horizontal joints; ASTM C 920, Type S, Grade P, Class 25, Use T and M; FS TT-S-00230C, Type I, Class A; USDA approved. Sonneborn "Sonolastic SL 1"

D. Two Component, Self-Leveling Polyurethane Sealant: ±25% movement capability for horizontal joints; ASTM C 920, Type M, Grade P, Class 25, Use T and M; FS TT-S-00227E, Type I, Class A; USDA approved. Sonneborn "Sonolastic SL 2"

E. Siliconized Acrylic Latex Sealant: ASTM C 834; USDA compliant. Sonneborn "Sonolac".

F. UV Resistant Silicone Sealant: ASTM C 920, Type S, Grade NS, Class 25, Use NT, A, and M; FS TT-S-001543A, Type Non-Sag, Class A; FS TT-S-00230C, Type II, Class A; USDA approved; SWRI validated. Sonneborn "Omniseal".

G. Mildew Resistant Silicone Sealant: ±25% joint movement capability; ASTM C 920, Type S, Grade NS, Class 25, uses NT, G, and A; FS TT-S-001543A, Type Non-Sag, Class A; USDA approved; SWRI validated. Sonneborn "OmniPlus".

H. NSF Approved Polysulfide Sealant: ±25% joint movement capability; ASTM C 920, Type M, Grade NS, Class 25, Use T, G, M, A, and O; FS TT-S-00227E, Type II, Class A; USDA approved; ANSI/NSF Standard 61 Certified. Sonneborn "Sonolastic Polysulfide Sealant".

I. Poured Flexible Epoxy Joint Filler: Sonneborn "Epolith-P"; two component 100% solids epoxy joint filler with flexible, pourable, self-leveling properties.

1. Shore A Hardness: 85 ± 5.
2. Shore D Hardness: 34.

3. Elongation: 75%.
4. Tensile Strength: 655 psi (4.5 MPa) ±10 psi (0.07 MPa).
5. Mixing Ratio: 1 to 1 by volume.
6. Pot Life: 40 to 55 minutes at 75 degrees F (24 degrees C).
7. Cure Time, Foot Traffic: 4 hours.
8. Cure Time, Vehicular Traffic: 24 hours.
9. Application Temperature: Minimum 55 degrees F (13 degrees C).

J. Gunned Flexible Epoxy Joint Filler: Sonneborn "Epolith-G"; two component 100% solids, gun-grade epoxy joint filler with flexible, pick-proof properties for sloped areas.

1. Shore A Hardness: 90 ± 5.
2. Shore D Hardness: 50.
3. Elongation: 50%.
4. Tensile Strength: 900 psi (6.2 MPa) ±10 psi (0.07 MPa).
5. Slant Shear Strength: 865 psi (6.0 MPa) per ASTM C 882.
6. Slant Shear Strength: 112 psi (0.8 MPa) per ASTM C 321.
7. Mixing Ratio: 1 to 1 by volume.
8. Pot Life: 40 to 55 minutes at 75 degrees F (24 degrees C).
9. Cure Time, Foot Traffic: 4 hours.
10. Cure Time, Vehicular Traffic: 24 hours.

2.03 ACCESSORIES

A. Primer: Sealant manufacturer's recommended primer when needed.

B. Joint Cleaner: Non-corrosive and non-staining type recommended by sealant manufacturer and compatible with joint forming materials.

C. Soft Backer Rod: non-gassing, reticulated closed-cell polyethylene rod designed for use with cold-applied joint sealants.

1. Comply with ASTM C 1330.
2. Size required for joint design.

D. Closed-Cell Backer Rod: closed-cell polyethylene rod designed for use with cold-applied joint sealants for on-grade or below-grade applications.

1. Comply with ASTM C 1330.
2. Size required for joint design.

E. Joint Filler: closed-cell polyethylene joint filler designed for use in cold joints, construction joints, or isolation joints wider than 1/4 inch (6 mm).

1. Size required for joint design.

F. Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

2.04 COLOR

A. Sealant Colors: Selected by Owner. Match site substrate colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect all areas involved in work to establish extent of work, access, and need for protection of surrounding construction.

B. Protect all surroundings from flexible epoxy joint filler including, but not limited to, floors, equipment, line striping, walkways, and drives.

C. Verify proper joint depth and width for each type of use.

3.02 PREPARATION

A. Remove loose materials and foreign matter which impair adhesion of joint filler.

B. Clean joints and saw cuts by grinding, sandblasting, or wire brushing to expose a sound surface free of contamination and laitance.

C. Ensure structurally sound surfaces, dry, clean, free of dirt, moisture, loose particles, oil, grease, asphalt, tar, paint, wax, rust, waterproofing, curing and parting compounds, membrane materials, and other foreign matter.

D. Where the possibility of joint filler staining of adjacent areas or materials exists, mask joints prior to application.

1. Do not remove masking tape before joints have been tooled and initial cure of joint filler has taken place.
2. Work stained due to failure of proper masking precautions will not be accepted.

F. Verify sealant compatibility with substrate and proper adhesion.

3.03 INSTALLATION

A. Back-Up Material:

1. Install appropriate size backer rod, larger than joint where necessary according to manufacturer's recommendations.
2. Install polyethylene joint filler in joints wider than 1/4 inch (6 mm) to back-up material per manufacturer's recommendations.
3. Do not install epoxy joint filler over backer rod.

B. Bond Breaker: Install bond-breaker strip in joint to be sealed on top of back-up material to prevent adhesion of sealant to back-up material; install per manufacturer's recommendations.

C. Sealant:

1. Prepare sealants that require mixing; follow manufacturer's recommended procedures, mixing thoroughly.
2. Mix only as much material as can be applied within manufacturer's recommended application time period.
3. Apply materials in accordance with manufacturer's recommendations; take care to produce beads of proper width and depth, tool as recommended by manufacturer, and immediately remove surplus sealant.

4. Apply materials only within manufacturer's specified application life period. Discard sealant after application life is expired or if prescribed application period has elapsed.

D. Epoxy Joint Filler:

1. Transfer entire contents of activator container thoroughly with entire contents of base container in separate container of appropriate size.
2. Mix only as much material as can be applied within manufacturer's recommended application time period.
3. Mix with slow-speed drill (80-100 rpm) and slotted paddle. Ensure mixing paddle reaches bottom and scrapes side of container several times. Scrape paddle several times to ensure thorough mixing. Keep paddle blade below surface to avoid whipping air into material.
   a. Mix Epolith(R)-P for 5 to 7 minutes.
   b. Mix Epolith(R)-G for 8 to 10 minutes.
4. Pour Epolith-P from spouted can or professional bulk-loading caulking gun.
5. Apply Epolith-G by professional bulk-loading gun.
6. Maintain minimum joint application of 2/3 joint depth or 1 inch (25 mm), whichever is greater.
7. Fill joints from bottom up to exterior face by holding properly sized nozzle against joint bottom.
8. Tool joint to ensure maximum adhesion to joint sides, correct bead configuration, and a neat joint. Dry tool or dampen tool with Reducer 990. Do not use water or soapy water.
9. Apply materials only within manufacturer's specified application life period. Discard joint filler after application life is expired or if prescribed application period has elapsed.

3.04 CLEANING

A. Remove uncured sealant and joint filler with xylene, toluene, or MEK, or other approved solvent. Remove cured sealant and joint filler by razor, scraping, or mechanically.

B. Remove all debris related to application of sealants from job site in accordance with all applicable regulations for hazardous waste disposal.

3.05 SCHEDULE OF JOINT SEALERS

A. Coordinate with manufacturer to obtain recommendations for each specific sealant application. Sealant used shall be manufacturer's recommended "best choice" for each application location considering substrate materials, exposure, joint movement, joint orientation, traffic loading, etc. Submit list of manufacturer's recommendations.

B. General-Purpose Interior and Exterior Applications:

1. Sealant:

   a. Single component polyurethane
   b. Two component polyurethane
   c. Polysulfide
   d. Silicone (where painting not required)

2. Applications:

   a. Joints and recesses between adjacent constructions and frames, sills, and subsills of windows, doors, and louvers.

b. Coping joints and wash joints in precast concrete, cast stone, or natural stone.
c. Masonry joints beneath shelf angles.
d. Around penetrations in exterior walls.
e. Under door thresholds and at bottom of door frames.
f. Where necessary to prevent infiltration of water or air into or through exterior building envelope.

C. Other Exterior Applications:

1. Sealant:

a. Single component polyurethane
b. Two component polyurethane
c. UV Resistant Silicone (where exposed to sunlight)
d. Mildew Resistant Silicone (roofing and flashing sealant hidden from sunlight)

2. Applications:

a. Between adjacent construction and gravel stops, copings, fascias, and miscellaneous flashings.
b. Metal flashings inserted into reglet.
c. Top edges of surface mounted counterflashing.
d. Expansion and control joints in masonry where expansion joint covers are not indicated.
e. Joints between new and existing exterior construction.

D. Interior Wetted Areas:

1. Sealant: Mildew Resistant Silicone
2. Applications: Between adjacent construction and vanities, shower stalls, bathtub and shower enclosures, sinks, counter tops, plumbing cut-outs, and plumbing fixtures.

A. Other Interior Applications:

1. Sealant:

a. Single component polyurethane
b. Two component polyurethane
c. Polysulfide
d. Acrylic Latex

2. Applications:

a. Between adjacent construction and equipment, shelving, casework, and furniture.
b. Perimeters of door and window frames, access panels.
c. Between interior partitions and adjoining concrete or steel columns, walls, or other construction.
d. Other exposed locations within partitions to seal against passage of air.
e. Other interior joints of small dimension which require painting.
f. Gypsum board partitions:

1) Between gypsum panels and dissimilar walls; install sealant just prior to installation of gypsum panel.
2) Between adjacent face layers of abutting intersection gypsum board partitions; install sealant before taping and finishing joint.

3) Between gypsum panels and penetrations: Seal around openings of ducts and pipes.
4) Seal control joints prior to installing control joint trim.

g. Other concealed locations within partitions to completely seal against passage of air.

3. Allow sealant to cure before painting over joint.

B. Exterior Traffic Surfaces:

1. Sealant:

a. Two component self-leveling polyurethane.
b. Single component self-leveling polyurethane.

2. Applications:

a. Control and expansion joints in sidewalks and pavements.

C. Interior Traffic Surfaces (where joint will be covered with floor covering):

1. Sealant:

a. Two component self-leveling polyurethane.
b. Single component self-leveling polyurethane.

2. Applications:

a. Control and expansion joints in floors.

D. Interior Traffic Surfaces (where no floor covering will be installed):

1. Surface preparation: Freshly saw-cut or blast-clean joints; blow with oil-free compressed air.

2. Sealant: Epoxy Joint Filler.

a. Pour flush with adjacent surface in 2 pours in accordance with manufacturer's instructions.

3. Applications: Control joints in floors subject to vehicular traffic.

E. Glazing:

1. Sealant:

a. Silicone.

2. Applications:

a. Glazing, including butt and lap sheer joints, stopless glazing, and cap, head and toe bead in conventional glazing.

J. Joints to be submerged:

1. Sealant:

a. Polysulfide Sealant

2. Applications:

a. Control joints at submerged locations.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Joint Sealants and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

DIVISION 8- DOORS AND WINDOWS
TABLE OF CONTENTS

SECTION 08110 – STEEL DOORS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes steel doors with light kits for control building. Also included is door installation.

1.02 RELATED WORK

A. Section 08710 – Door Hardware
B. Division 9 for painting

1.03 REFERENCES

A. American Society for Testing and Materials

1. ASTM B 117 - Standard Practice for Operating Salt Spray (Fog) Apparatus
2. ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
3. ASTM A 568 & A 569 – Standard Specification for Steel, Sheet, Carbon, Hot-Rolled, Commercial Quality.
4. ASTM A 653 – Standard Specification for Steel, Sheet, Zinc-Coated (Galvannealed) by the Hot-Dip Process
5. ASTM A 924 – Standard Specification for General Requirements for Steel, Sheet, Metallic Coated by the Hot-Dip Process
6. ASTM D 1735 - Standard Practice for Testing Water Resistance of Coating Using Water Fog Apparatus

B. American National Standards Institute

1. ANSI A224.1 – Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
2. ANSI A250.3 – Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames
3. ANSI A250.4 – Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing
4. ANSI A250.6 (SDI 107) – Hardware on Standard Steel Doors (Reinforcement-Application)
5. ANSI A250.7 – Nomenclature for Steel Doors and Steel Door Frames
6. ANSI A250.8 (SDI-100) – Recommended Specifications for Steel Doors & Frames
7. ANSI A250.10 – Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
8. ANSI/DHI A115 – Specifications for Hardware Preparations in Standard Steel Doors and Frames
9. ANSI/DHI A115.IG – Installation Guide for Doors and Frames

C. Steel Door Institute

1. SDI 106 – Recommended Standard Door Type Nomenclature
2. SDI 108 – Recommended Selection and Usage Guide for Standard Steel Doors

3. SDI 109 – Hardware for Standard Steel Doors & Frames
4. SDI 111 – Recommended Standard Details for Steel Doors and Frames
5. SDI 112 – Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors & Frames
6. SDI 122 – Installation and Troubleshooting Guide for Standard Steel Doors and Frames
7. SDI 124 – Maintenance of Standard Steel Doors and Frames

1.04 REGULATORY REQUIREMENTS

A. Doors and frames shall conform to applicable codes for fire ratings.

B. Install fire labeled doors and frame products in accordance with NFPA-80, current edition.

1.05 SUBMITTALS

A. Submit shop drawings, product data, and O&M data under provisions of Division 1.

B. Indicate door elevations, material thickness, internal reinforcement, closure method, and cutouts for louvers.

C. Submit manufacturer's installation instructions and other information as necessary to show specification and code compliance.

D. Submit samples of manufacturer's colors for Owner selection.

1.06 DELIVERY, STORAGE AND PROTECTION

A. Doors shall be stored in an upright position under cover. Place the units on at least 4-inch wood sills on floors in a manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters which create humidity chambers and promote rusting. If the corrugated wrapper on the door becomes wet, or moisture appears, remove the wrapper immediately.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Doors and Frames shall be manufactured by Amweld, Steelcraft, Fleming, or approved equal. All products supplied under this Section shall be from a single manufacturer.

2.02 MATERIALS

A. Frames, frame components, and doors shall be manufactured tension leveled steel conforming to ASTM A924, galvanized to ASTM A653, commercial steel (CS), coating designation A40 (Galvanneal). Galvannealed steel shall be treated to insure proper paint adhesion. All steel component parts used in galvannealed doors and/or frames shall meet the galvanized specification.

B. All exterior doors, frames and frame components shall be cleaned, phosphatized and finished as standard with one coat of rust inhibiting prime paint in accordance with ANSI A250.10. Exterior doors and frames will be field painted.

2.03 DOORS

A. Exterior doors

1. 16-gage hot dipped galvannealed steel, with closed tops.

2. Full-flush Seamless construction, continuous smooth welded or epoxy filled mechanically interlocked edge seams.

3. Sizes and style as shown on the drawings. Verify size and thickness with on-site measurements.

4. Rigid extruded polystyrene, polyisocyanruate, or polyurethane core, fire retardant, thermal value: R11.0 minimum, conforming to ASTM C578.

B. Construction of Doors:

1. Doors shall be reinforced, stiffened, sound deadened and insulated with impregnated specified core completely filling the inside of the doors and laminated to inside faces of both panels using contact adhesive applied to both panels and core.

2. Door shall have continuous vertical mechanical interlocking or welded joints at lock and hinge edges with visible edge seams (interior) or with edge seam filled and ground smooth (exterior). The internal portion of the seam shall be sealed with epoxy, or welded. An intermittent fastening along the seam is not permitted. Doors shall have beveled (1/8" in 2") hinge and lock edges. Top and bottom steel reinforcement channels shall be galvannealed 14 gauge and projection welded to both panels.

3. Hinge reinforcements shall be 7-gauge for 1-3/4" doors. Lock reinforcements shall be 16 gage and closer reinforcements 14 gauge - box minimum 6" high and 20" long. Hinge and lock reinforcements shall be projection welded to the edge of the door. Doors shall be factory blanked, reinforced, drilled and tapped for fully templated hardware and factory blanked and reinforced for hardware that is not fully templated. Galvannealed doors shall have galvannealed hardware reinforcements. Adequate reinforcements shall be provided for other hardware as required. Coordinate with specified hardware. Hinge locations must match existing frames, Contractor to verify.

4. Trim for doors with cutouts shall be 24-gage steel conforming to ASTM designation A 924 hot dipped galvannealed steel with a zinc coating of 0.06 ounces per square foot (A60). The trim shall be installed into the door as a four sided welded assembly. The trim shall cap the cutout but shall not extend more than 1/16" from the door face. The corners of the assembly shall be mitered, reinforced and welded. The trim shall be the same on both sides of the door. Exposed fasteners shall not be permitted. Label and non-label doors shall use the same trim.

5. All exterior out swing doors shall have the tops closed to eliminate moisture penetration. Door tops shall no have holes or openings. Top caps are permitted. All exterior doors shall include a self-adjusting, concealed door sweep installed in the bottom channel. The bottom seal shall not utilize springs.

6. Door faces shall be fabricated without visible seams, free of scale, pitting, coil brakes, buckles or waves.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify door frame openings are installed plumb, true and level, and dimensionally correct before beginning the installation process. Make corrections and/or adjustments as necessary.

B. Verify that proper door and frame reinforcement has been provided for the specified hardware and that cutouts and reinforcements are properly located.

C. Select fasteners of adequate type, number and quality to perform the intended functions.

D. Verify that louver cutouts are located and sized properly.

3.02 INSTALLATION

A. Doors and frames shall be installed in accordance with ANSI/DHI A115.IG Installation Guide for Doors and Frames and manufacturer's installation instructions.

B. Adjust operable parts for correct clearances and function.

C. Exposed field welds shall be finished to present a smooth, uniform surface. Touch-up with rust inhibitive primer.

D. Exposed surfaces that have been scratched or otherwise marred during shipment, installation or handling shall be touched-up with a rust inhibitive primer.

E. Finish paint in accordance with Section 09900.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Steel Doors and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 08305 – CAST-IN ACCESS DOORS

PART 1 GENERAL

1.01 SUMMARY

A. The work in this Section consists of furnishing all labor and materials, and performing all work necessary for the proper installation of cast-in-place metal access doors as indicated on Plans. Coordinate with access door manufacturer and pre-cast wetwell and vault manufacturer(s).

1.02 REFERENCES

A. Section 03300 – Cast-In-Place Concrete.

1.03 SUBMITTALS

A. Submit product data in accordance with Section 01300.

B. Submit shop drawings showing layout, profile and product components including attachment, accessories, finish and color. Submit shop drawings for approval prior to fabrication.

1.04 PROJECT CONDITIONS

A. Verify all dimensions before ordering product. Contractor is responsible for product fitment and function.

1.05 WARRANTY

A. Provide written warranty signed by Manufacturer, agreeing to repair or replace equipment which exhibits defects in materials or workmanship for a minimum period of 5 years.

PART 2 PRODUCTS

2.01 ACCESS HATCH

A. Access cover shall be designed for cast-in-place installation. All surfaces that will come into contact with concrete shall be coated with bitumastic paint.

B. Access covers shall be single or double leaf with integral safety grate. Safety grate shall not allow hatch to be closed unless the fall through protection has been put back in place. Safety grate shall be constructed of aluminum and painted safety orange. Safety grate shall have a load rating at least equal to the load rating of access cover.

C. Frame shall be extruded aluminum channel and all surfaces that will come into contact with concrete shall be coated with bitumastic paint.

D. Frame and hatch shall be rated for H20 wheel loading.

E. Hatch shall be constructed of ¼" thick aluminum diamond tread plate. Hatch shall be equipped with pneumatic-spring lift assist and automatic hold-open arm. Hatch must be easily opened such that one person can reasonably open hatch with one hand.

F. Hatch shall be equipped with a stainless steel slam lock with protected keyway. Lock shall be fastened with 316 stainless steel hardware.

G. Hinge shall be 316 stainless steel construction with 316 stainless steel hinge pin. Hardware shall be 316 stainless steel.

H. Hatch shall be equipped with a stainless steel flush drop handle.

I. Wetwell pump station hatch shall have clear opening of 36"x48".

J. Valve vault hatch shall have clear opening of 5436"x30".

K. Flow meter vault hatch shall have clear opening of 36"x30".

L. Manufacturer shall be Syracuse Castings, Halliday Products, Nystrom; or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install per manufacturers recommendations and per contract drawings. Steel rebar shall not be allowed to be in contact with any portion of aluminum frame. Hatches shall open in direction indicated on drawings. No alteration of location or orientation will be allowed without written approval by the Engineer.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Cast-In Access Doors and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 08710 – DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes items known commercially as finish hardware or builders hardware, required for swing and other doors.

B. Types of finish hardware may include: hinges, lock cylinders and keys, lock and latchsets, bolts, thresholds, protection plates, weatherstripping, sound stripping, astragals, and other miscellaneous door hardware as required.

1.02 REFERENCES

A. ANSI A117.1 – American National Standards Institute Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People

B. ANSI A115.1 – Specification for Standard Steel Door and Frame Preparation for Mortise Locks for 1 3/8" and 1 ¾" Doors

C. ANSI A115.2 – Specification for Standard Steel Door and Frame Preparation for Bored or Cylindrical Locks for 1 3/8" and 1 ¾" Doors.

D. ANSI/BHMA A156.2 – Bored and Preassembled Locks and Latches

E. ANSI/BHMA A156.13 – Mortise Locks and Latches

F. ANSI/BHMA A156.18 – Materials and Finishes

G. National Fire Protection Association (NFPA) Standard No. 80. This requirement takes precedence over other requirements for such hardware.

1.03 SUBMITTALS

A. Submit Hardware Schedule, 3 copies

1. Detailed hardware schedule shall be prepared by an experienced hardware consultant. All items shall be suitable for the intended location and purpose.
2. Hardware finish and styles shall match as closely as possible at all locations.
3. Organize hardware schedule into "hardware sets" for each door, indicating complete designations of every item.
4. Include manufacturer's technical data and hardware directions for each door.
5. Do not order materials until Schedule has been reviewed and approved by the Engineer.

B. Deliver templates to fabricators of other work which is to receive finish hardware.

1.04 QUALITY ASSURANCE

A. Use products of similar type from one manufacturer throughout project. Coordinate with manufacturer for proper use and installation of each piece of hardware.

B. Hardware supplier shall be a recognized builders hardware supplier, who has been furnishing hardware in Oregon for a period of not less than 3 years. Supplier shall employ an experienced AHC certified hardware consultant, available for consultation during the course of the work.

C. Hardware supplier shall prepare detailed hardware schedule based on these specifications and their experience for the best use and function of hardware.

1.05 WARRANTY

A. Blanket coverage on locksets for a minimum period of 5 years. Mechanical failure on door closers for 5 years. Failure on other parts of hardware for 2 years. These minimums may be superceded by specific requirements in the following sections.

PART 2 PRODUCTS

2.01 FINISH

A. All hardware shall have a silver satin (dull, brushed) finish. Finishes from various manufacturers and different hardware shall be matched as closely as possible.

2.02 HINGES

A. Five knuckle, button tip, full mortise template type with non-rising loose pins and ball bearings. Manufactured by Stanley; or approved equal.

B. Doors up to 36-inches wide: 4.5-inch by 4.5-inch. Provide at least 3 hinges per leaf for doors up to 86-inches high.

C. Exterior Doors: 4 ball bearing, stainless steel, 0.180 gage minimum hinges with non-removable pin construction.

2.03 LOCKS

A. Heavy-Duty Cylindrical Locks and Latchsets. Reversible door handing. Solid cast Lever handles. Schlage ND-Series Grade 1, Style ND92PD Entrance Lock.

1. Lockset must be cylindrical type with minimum 2 ¾-inch backset, with 1/2-inch throw latchbolt.
2. Lockset with 6-pin interchangeable and masterkeyed core.
3. Keyed lever to be removeable only after core is removed, by authorized control key, to allow access to lever "keeper".
4. Locks to have solid shank with no opening for access to keyed lever keeper.
5. Locksets and latchsets must conform to ANSI A156.2, Series 4000, Grade 1. and be UL listed.
6. Keys shall be matched to Owner's existing pump station master key set. Provide matching keys and coordinate with Owner

2.04 THRESHOLDS

A. Thresholds shall have height and shape conforming to ANSI A117.1 with height not exceeding ½-inch. Aluminum with corrugated surface.

2.05 WEATHERSTRIPPING

A. Silicone rubber seal. Provide at each edge of every exterior door. Pemko, Reese, or approved equal.

2.06 KEYING

A. All door locks shall be keyed alike for a single building. Contractor shall provide contractor lock cores for use during construction. Replacement lock cores shall be provided in unopened packaging to the Owner upon completion.

2.07 HARDWARE SCHEDULE

A. Exterior Doors

1. Heavy-Duty Cylindrical Locks
2. Heavy-Duty Security Deadbolts
3. Threshold
4. Weatherstripping

PART 3 EXECUTION

3.01 PREPARATION

A. Ensure that door and frame reinforcements have been provided properly for the hardware to be used.

B. Have sufficient quantities of fasteners required. Use fasteners supplied by the hardware manufacturer.

C. Doors to be field painted shall be painted prior to installing hardware.

3.02 INSTALLATION

A. Install door hardware in accordance with the manufacturer's instructions. Use fasteners provided by hardware manufacturer.

B. Ensure that proper hardware is mounted for each specific door according to the approved hardware schedule. Note where left and right handed doors are shown.

C. Adjust strikes, latches and closers for proper function. Readjust prior to final acceptance if necessary.

D. Upon completion, deliver all keys to Owner.

E. Standards: Install in accordance with requirements of DHI and BHMA. Mounting height measurements are from finish floor except top butt.

1. Butts: Top 11 3/4" center of butt to top of door; intermediate equal distance between top and bottom butts; bottom 13" to center of butt.
2. Knob Locks: 40 5/16" to center of strike.
3. Deadlocks: 48" to center of strike.
4. ADA Standard: Conform to ANSI A117.1 for positioning requirements for disabled.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Door Hardware and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

DIVISION 9- FINISHES
TABLE OF CONTENTS

SECTION 09900 – PAINTS AND COATINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work in this section includes furnishing and field application of all paints and coating systems required for interior and exterior coating of drywall, wood, steel, iron, plastic, concrete, masonry, and other materials to be painted.

1. Unless otherwise specified or shown, paint all surfaces and items that are exposed to view.

B. Section also necessary surface preparation, protection, curing and touch-up.

C. Summary of items to be painted on this project under this section include:

1. Exposed piping, including pipe inside vaults.
2. Interior ceiling and CMU walls
3. Steel doors and frames on control building.
4. Exterior wood trim and other exposed wood
5. Fiber cement siding
6. Any new materials provided not prefinished or painted.

1.02 RELATED SECTIONS

A. Division 15 – Mechanical: Fabricated and/or shop primed items
B. Division 16 – Electrical: Fabricated and/or shop primed items

1.03 SURFACES NOT TO BE PAINTED

A. Prefinished items including finished metal surfaces.
B. Walls or ceilings of concealed or inaccessible areas.
C. Fire or smoke rating labels on doors or frames.
D. Equipment name plates.
E. Piping identification labels.
F. Moving parts of mechanical or electrical equipment.
G. Cast in place concrete surfaces.

1.04 SUBMITTALS

A. Product Data

1. Materials List: Complete list of proposed manufacturers and products.
2. Manufacturer's Specifications: Manufacturer's technical information for each product, including paint analysis and application instructions.
3. Material safety data sheets for each product.

B. Samples: Preliminary Samples: 8-1/2" x 11" samples of each color, texture and sheen on glossy card stock. Owner will select colors to be used from manufacturer's standard.

D. Certificates: Provide certificate from each manufacturer stating material is premium quality and suitable for intended use on this Project.

E. Closeout Submittals:

1. Two copies of manufacturer's color and sheen formula, and 4" x 6" color chips, for each final color used in the Project.
2. Product Usage Records: Three copies of product usage records for each paint, coating and solvent product used in the project. Include product name, amount used, surface preparation records, and period of time over which the product was used.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years successful experience in work of similar scope.
B. Regulatory Requirements: Products containing chromates, cadmium, lead, or mercury or are not permitted.
C. Manufacturer's Instructions: Perform painting work in accordance with manufacturer's written instructions and recommendations.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Project in original, new, unbroken packages and containers bearing manufacturer's name and label, with:
   1. Name of material, color and sheen.
   2. Manufacturer's name, product number and date of manufacture.
   3. Contents by volume of major pigments and vehicle constituents.
   4. Thinning and application instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: ICI Paint Stores, Tnemec, Benjamin Moore, or Sherwin Williams.

   1. Unless otherwise indicated, Tnemec products are specified in Paint Schedule Articles 3.03 to establish standards and type of materials required. Equal products of manufacturers specified above are acceptable.

2.02 MATERIALS

A. Material Quality

   1. Provide premium quality materials. Materials not bearing manufacturer's identification as a premium-grade product are not acceptable.
   2. Should manufacturer's specifications or product numbers change, provide its current equal or better product.
   3. Primer and undercoats are to be of same manufacturer as final coat.
   4. Materials left from previous jobs are not acceptable.
   5. Use only thinners approved by paint manufacturer, and use only within recommended limits.
   6. Etching Solutions: As recommended by paint manufacturer for the use intended.
   7. Solvents: Non-petroleum based, as recommended by paint manufacturer for the use intended.

B. Finish Coat Coordination: Provide finish coats which are compatible with prime paints used.

2.03 COLORS

A. General

1. Use of proprietary names in color selections does not imply exclusion of equivalent products of other manufacturers.
2. The proposal and acceptance of any paint manufacturer shall not restrict the owner to selection of standard colors of that manufacturer.

B. Finish coat colors shall be factory mixed.

PART 3 EXECUTION

3.01 PREPARATION

A. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as specified for substrate condition.

B. Remove hardware, accessories, and items in place and not to be painted, or provide protection prior to surface preparation and painting. Reinstall removed items after painting.

C. Clean surfaces before applying paint. Remove oil and grease prior to mechanical cleaning. Schedule cleaning so contaminants from cleaning process do not fall onto wet, newly painted surfaces.

D. Moisture Content: Do not paint over surfaces where moisture content exceeds manufacturer's instructions.

E. Ferrous Metals:

1. Bare Surfaces: Clean of oil, dirt, loose mill scale, and other foreign substances with solvent or by mechanical cleaning.
2. Shop Applied Primer: Touch up where damaged or bare using same type of primer as adjacent surfaces.
3. Galvanized Surfaces: Clean free of oil and surface contaminants using solvent.

F. Plywood/Gypsum Board: Remove dust, and repair surface imperfections. Spot-prime defects after repair.

G. Mix painting materials in accordance with manufacturer's instructions.

H. Store materials in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

I. Stir materials before application to produce mixture of uniform density, and stir as required during application. Do not stir surface film into material, strain material before using if necessary.

3.02 APPLICATION

A. Apply paint in accordance with manufacturer's instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Apply additional coats when stains or blemishes show through final coat, until paint is a uniform finish, color and appearance.
2. Ensure dry film thickness at corners and crevices is equivalent to that of flat surfaces.
3. Sand lightly between each succeeding enamel or varnish coat.
4. Finish exterior doors on tops, bottoms and side edges same as exterior faces.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated or otherwise prepared for paint as soon as practicable after preparation.

1. Do not apply materials in areas where dust is being generated, or will be generated, before coatings are thoroughly dry.
2. Allow time between successive coats to permit proper drying.
3. Do not recoat until paint feels firm and does not deform or feel sticky under moderate thumb pressure.

C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to achieve a total dry film thickness (DFT) as recommended by coating manufacturer and as specified.

D. Prime Coats: Apply to items not previously primed. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat.

E. Finish Coats: Provide even texture. Leave no laps, irregularity in texture, skid marks, or other surface imperfections.

1. Opaque Finishes: Provide opaque, uniform finish, color and coverage. Cloudiness, spotting, holidays, brush marks, runs, sags, ropiness or other surface imperfections are not acceptable.
2. Transparent Finishes: Provide glass smooth surface film of even luster. Cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections are not acceptable.

F. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not accepted.

3.03 PAINT SCHEDULE

EXTERIOR COATINGS				
Location	**Preparation**	**Primer / Intermediate**	**Finish Coats**	**Total DFT**
Unprimed Metals	Commercial Blast (SSPC-SP6)	Series 66 or N69 Hi-Build Epoxoline Two coats DFT 3.0-5.0 mils, each coat	Series 73, or 1075 Endura-Shield Polyurethane DFT 2.0-5.0 mils	9.0 – 13.0 mils
Shop-Primed Metals	Hand Tool or Power Tool (SSPC-SP2 or SP3)	Factory Primed Intermediate coat of Series 27 Typoxy DFT 2.0-3.0 mils	Series 73, or 1075 Endura-Shield Polyurethane DFT 2.0-3.0 mils	4.0 – 6.0 mils
Wood	Clean and Dry	Series 36 Undercoater DFT 2.0-3.5 mils	Series 23 Enduratone DFT 2.0-3.0 mils	4.0 – 6.5 mils

Ductile Iron Pipe	As recommended by manufacturer	Series 66 or 69 DFT 3.0 to 3.0 mils/ Intermediate coat Series 66 or 69 DFT 4.0 to 6.0 mils	Series 73, 1074 or 1075 DFT 2.0 to 3.0 mils	9.0 – 14 mils
INTERIOR COATINGS				
Location	**Preparation**	**Primer / Intermediate**	**Finish Coats**	**Total DFT**
Unprimed Metals	Commercial Blast (SSPC-SP6)	Series 66 or N69 Hi-Build Epoxoline Two coats DFT 3.0-5.0 mils, each coat	Series 73, or 1075 Endura-Shield Polyurethane DFT 2.0-5.0 mils	9.0 – 13.0 mils
Shop-Primed Metals	Hand Tool or Power Tool (SSPC-SP2 or SP3)	Factory Primed. Intermediate coat of Series 27 Typoxy DFT 2.0-3.0 mils	Series 73, or 1075 Endura-Shield Polyurethane DFT 2.0-3.0 mils	4.0 – 6.0 mils
Wood	Clean and Dry	Series 36 Undercoater DFT 2.0-3.5 mils	Series 23 Enduratone DFT 2.0-3.0 mils	4.0 – 6.5 mils
CMU (unpainted)	ASTM D4259	Series 130 Envirofill Intermediate Coat: Series 113 H.B. Tneme-Tufcoat DFT 4.0-6.0 mils	Series 113 H.B. Tneme-Tufcoat DFT 4.0-6.0 mils	8.0 – 12.0 mils plus filler
Gypsum Board	Clean and Dry	Series 51-792 PVA Sealer or 151-1051 Elasto-Grip FC DFT 1.0-2.0 mils	Series 113 H.B. Tneme-Tufcoat DFT 4.0-6.0 mils	5.0 – 8.0 mils

3.04 APPROVED EQUALS

A. The painting materials listed above are provided as references. Approved equal materials will be allowed upon submittal.

3.05 COLOR SCHEDULE

A. Contractor to coordinate with Owner and Engineer for color selections.
B. For exterior touch-up, match existing paint colors.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Paints and Coatings and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

DIVISION 11- EQUIPMENT
TABLE OF CONTENTS

SECTION 11310 – SUBMERSIBLE CENTRIFUGAL PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specifications for the submersible centrifugal pumps and motors for wastewater pumping.

1.02 SUMMARY

A. Two (2) pumps are required, 1 duty pumps and 1 pump for redundancy. Each pump will run independently, or in conjunction with one other pump to meet the duty point. Maximum design flow will be achieved with one (1) pump running. Pumps will alternate starts and run cycles to achieve approximately equal run time averages.

B. Pump shall be supplied with electric motor, close coupled volute, and cast iron discharge elbow, guide bar brackets, power cable and accessories.

C. The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer. Provide individual conduits for each pump supplied to wetwell disconnect panel.

1.03 RELATED SECTIONS

A. Division 16 for drives, control unit and other electrical requirements

1.04 QUALITY ASSURANCE

A. The pumps shall be heavy duty, electric submersible, centrifugal non-clog units designed for handling raw unscreened sewage and wastewater and shall be fully guaranteed for this use.

B. The pumps shall be capable of operating in an ambient liquid temperature of 104 degrees F as specified by the National Electrical Manufacturers Association (NEMA) and Factory Mutual (FM).

C. The pump and motor shall be suitable for continuous operation at full nameplate load while the motor is completely submerged or partially submerged.

D. Motor horsepower shall be sufficient to be non-overloading over entire pump curve.

E. The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.

F. The pump, motor and associated devices shall be suitable for no less than 15 evenly spaced starts per hour without overheating.

1.05 WARRANTY

A. Warranty shall meet the standard warranty requirement as outlined in the contract documents.

B. Warranty period shall commence on date of valid start-up.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer or as otherwise shipped and protected by the manufacturer.

B. Store equipment in a clean dry area indoors in accordance with manufacturer's instructions. Keep containers sealed until ready to use.

C. Protect equipment during handling and installation to prevent damage or contamination.

1.07 SUBMITTALS

A. Technical submittal data shall consist of:

1. Certified pump performance curves
2. Anticipated frequency in Hz for flow conditions indicated in Section 2.01.A
3. Pump outline drawing
4. Electrical motor data
5. Control drawing and data
6. Typical installation guides
7. Technical manuals
8. Parts list
9. Printed warranty
10. Manufacturer's equipment storage recommendations
11. Manufacturer's standard recommended start-up report form

1.08 SPARE PARTS

A. For each pump, an appropriate set of spare parts shall be provided, based on the manufacturer's recommendations, to allow expeditions servicing of the pump and returning it to full service. At a minimum, a complete set of mechanical seals, gaskets, wear rings, and spare impeller shall be provided.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Static head approximately 44.5 feet.

B. System shall be capable of producing a minimum of 700 gpm at 57 feet total dynamic head with one pump running under old pipe conditions with C = 120.

C. System shall also be capable of producing:

1. 700 gpm at 52.8 feet total dynamic head with one pump running under new pipe conditions with C = 150.
2. 500 gpm at 51.1 feet TDH with one pump running under old pipe conditions with C = 120 and 48.9 feet TDH under new pipe conditions with C = 150.
3. 275 gpm at 46.7 feet TDH with one pump running under old pipe conditions with C = 120 and 46 feet TDH under new pipe conditions with C = 150

D. Pumps shall be capable of running at 45 Hz, or less, for sustained periods of time without overheating.

E. Voltage requirements: 460 Volt, 3-phase, 60 Hz.

2.02 MANUFACTURER AND MODEL

A. ITT Flygt, Model NP3153.091 HT with 263 mm impeller. Motor shall be explosion proof, 20 hp, 460 volt, 60 Hz, 3 phase, 4 pole as supplied by ITT Flygt.

B. Pump and manufacturer of equal quality to those named above, and meeting the requirements of these specifications.

2.03 CONSTRUCTION

A. PUMP DESIGN

1. The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two (2) guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wetwell. No portion of the pump shall bear directly on the sump floor.

B. EXPLOSION PROOF MOTOR AND CABLE

1. 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 a U.S. nationally recognized testing laboratory (U.L., FM, CSA) at the time of the bidding of the project. As required by Factory Mutual (FM) the motor shall be capable of continuous operation in pumped media up to 104°F.

2. Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of at least 65 feet.

3. Motors shall be Inverter Duty, premium efficiency.

4. Motor shall be NEMA design with minimum 1.15 service factor, 40°C ambient.

5. Motor shall have a voltage tolerance of ±10% from nominal, and voltage imbalance tolerance of 1%.

6. Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm.

7. Power cables shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. Cables shall be appropriate for use with variable frequency drives. Cables shall be routed from pump to wetwell panel in separate conduits.

C. SEALS AND BEARINGS

1. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The minimum L_{10} bearing life shall be 50,000 hours at any usable portion of the pump curve.

2. Each pump shall be provided with a lubricant chamber for the shaft seal system. Seals shall not be lubricated by the pumped medium. Seal springs shall be isolated from pumped medium.

3. Each pump shall be equipped with tandem mechanical shaft seal system. Seal rings shall be tungsten-carbide or silicon-carbide.

4. Seals shall be mechanically protected from abrasive particulate matter and fibrous material.

5. A separate seal leakage chamber shall be provided so that any leakage that may occur past the seals will be captured prior to entry into the motor stator housing. Leakage chamber shall be equipped with a device to send a signal to an alarm if the chamber should reach 50% capacity.

D. SHAFT

1. The pump shaft and motor shaft shall be an integral, on piece unit adequately designed to meet the maximum torque required at any normal start-up condition and any operational point on the pump curve. Multi-piece, welded, sleeved or mechanically coupled shafts are not acceptable.

2. Shaft shall have full shutoff head design factor of safety of 1.7 or greater.

3. Shaft shall be stainless steel. Carbon steel or chrome plated steel are not acceptable.

E. IMPELLER

4. The impeller shall be dynamically balanced to prevent vibration and shall be capable of passing a minimum 3-inch diameter sphere, as required by Oregon DEQ.

5. The impeller shall be constructed of grey cast iron, leading edges of impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in raw wastewater.

6. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw or by an adjustable wear plate.

7. The impeller shall be locked to the shaft, held by an impeller bolt and treated with a corrosion inhibitor.

F. VOLUTE

1. Pump volute shall be single-piece gray cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller.

2. Discharge shall be 4-inch flange.

G. CABLE ENTRY

1. The cable entry design shall not require a specific torque to insure a water tight seal.

2. The cable entry shall consist of cylindrical elastomer grommets, flanked by stainless steel washers.

3. Cable entry designs which utilize potting compounds to provide a water tight seal, or those which do not allow the cable to be easily changed in the field shall not be considered equal.

H. CONTROLS – See Division 16

I. FINISH

1. Pump and motor surfaces not constructed of stainless steel shall be factory primed and painted.

J. PROTECTION

1. Pumps shall be equipped with moisture-sensing probes to detect moisture intrusion, and shall also have over-temperature sensors.

K. LIFTING PROVISIONS

1. Each pump shall be fitted with minimum 3/8" Grade 30 galvanized lifting chain, or 3/8" 316 stainless steel of appropriate length, including shackles and appropriate Grip-Eyes for lifting pumps in multiple bites. Grip-Eye lifting system shall consist of stainless steel cable connected to lifting chain attached to the lifting bail of the pump. Grip-Eye shall be forged steel and designed for the intended lifting application.

L. GUIDE RAIL SYSTEM

1. Guide rails shall be 2-inch, schedule 40 stainless steel pipe per manufacturer recommendations.

2. Intermediate guide bar brackets shall be supplied. Bracket, U-Bolt and hardware shall be either stainless steel or hot-dip galvanized structural steel. Install one intermediate guide bar bracket at the center of each guide bar length (one per pump).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions at locations shown on the drawings and as directed.

B. Construct pump base in accordance with drawings and manufacturer recommendations. Level and grout as required. Use properly sized stainless steel anchor bolts. Ensure that pump is completely level and plumb.

C. The pump and motor shall be factory assembled and tested prior to shipment to the project site. The manufacturer shall certify, and shall submit to the Engineer in writing, that all factory testing has been completed prior to shipment.

3.02 STARTUP & TESTING

A. Manufacturer shall furnish the services of a qualified factory trained field service engineer for one 8-hour working day 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 have the manufacturer do the following:

1. Megger stator and power cables
2. Check seal lubrication
3. Check for proper rotation
4. Check power supply voltage
5. Measure motor operating load and no load current
6. Check level control operation and sequence

B. All units shall be field tested to determine the head, flow and electrical characteristics to ensure that equipment meets the specifications. After installation, the pump shall be dry tested to ensure smooth operation of all components. Acceptance tests shall be run to ensure that each pump meets the following requirements:

1. The pumping units operate as specified without excessive noise, cavitation, vibration, or without overheating.

2. All automatic and manual controls are functional and capable of operating the pumps as specified.

3. All drive equipment operates without overload.

4. Pumps which do not provide the required flow at the stated head, or provide the required turndown flow rates, will be removed and replaced, or modified as required and accepted by the Owner.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Submersible Centrifugal Pumps and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

DIVISION 13- SPECIAL CONSTRUCTION
TABLE OF CONTENTS

SECTION 13420 – MAGNETIC FLOW METER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specifications for the flow meter that will measure wastewater flows discharged from the pump station.

1.02 SUMMARY

A. The meter shall be magnetic type (magmeter) complete with flanged metering tube, remote wall-mount data display/keypad/transmitter, and sufficient interconnecting signal cable.

B. Meters shall be equipped to forward analog signals to the pump controller from the meter remote display/signal converter. The flow proportional signal will be used to display rate/total (both at the remote display and the SCADA computer) and control the speed of variable frequency drive pumps to provide a specific flow as set by the Operating Strategy.

C. Flow range will range from 0 to 1,000 gpm.

D. Provide a spool sized to replace the flow meter in-line to allow flowmeter to be removed for service if necessary.

1.03 RELATED SECTIONS

A. Division 3 for precast concrete flowmeter vault.

B. Division 16 for signal and power wiring.

1.04 QUALITY ASSURANCE

A. Manufacturer shall specialize in flow measurement and shall have been providing flow meters for a minimum of 5 years. Entire unit, including meter body, flow transmitter, and remote display/flow computer shall be shipped as a single package from the manufacturer.

1.05 WARRANTY

A. Warranty shall meet the standard warranty requirement as outlined in the contract documents.

B. All components making up the meter shall be warranted for 24 months from date of shipment and defects due to faulty materials or workmanship will be repaired or replaced free of charge during the two year warranty period.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer or as otherwise shipped and protected by the manufacturer.

B. Store equipment in a clean dry area indoors in accordance with manufacturer's instructions. Keep containers sealed until ready to use.

C. Protect equipment during handling and installation to prevent damage or contamination.

PART 2 PRODUCTS

2.01 MANUFACTURERS & MODELS.

A. The meter shall be McCrometer Ultra Mag UM06, Endress and Hauser Proline Promag, or equal. Meter body shall have 8-inch flanges.

2.02 CONSTRUCTION

A. Body

1. The meter tube shall be fabricated stainless steel pipe with 150 pound AWWA Class "D" flanges for mating to 8-inch pipe. Meter tubes shall have a constant nominal inside diameter offering no obstruction to the flow.

2. Interior of body shall be fully lined with polyurethane or fusion bonded epoxy.

3. Electrodes shall be 316 stainless steel, or C22 tantalum.

4. Meter body exterior shall be a factory applied corrosion resistant coating, polyurethane or Al/Zn coating.

B. Signal Converter

1. The signal converter shall be independent from the meter body and shall be supplied with up to 300 feet of interconnecting cable. Signal converter shall be wall mounted in control building. Contractor to verify installation location and order specific cable length to avoid unnecessary looping of extra cable.

2. The signal converter shall be microprocessor based with backlit LCD for continuous display of rate of flow and total volume of flow. Rate shall be displayed in gallons per minute (gpm) and totalized volume in gallons.

3. Unit shall be housed in a NEMA 4X case. Unit shall be wall-mounted in the control building as shown in the drawings or as directed by Engineer.

4. Instrument shall be factory programmed and shall include a self diagnostic test mode, password protected configuration parameters, and a front panel keypad used change display and parameters. The converter shall be compatible with Microsoft Windows and other software programs with built in terminal communication capabilities through an interface port.

5. The converter shall provide an isolated 4-20 mA output.

6. Unit shall store all data in a non-volatile memory with 10-year retention.

C. Grounding ring shall be 316 stainless steel or C-22 tantalum and shall be supplied with meter tube.

2.03 PERFORMANCE

A. When installed in accordance with manufacturer's instructions, meter shall have the following minimum accuracy:

1. Display, serial communications and frequency output accuracy to be ±0.2% of reading or ±0.003 ft/sec, whichever is greater.

2. Repeatability and reproducibility shall be ±0.05% or ±0.0008 ft/s, whichever is greater.

2.04 FLOW METER SPACER

A. Flow meter spacer shall be constructed of 8-inch stainless steel pipe with welded flanges. Spool shall be precisely sized to replace the flow meter in-line. Contractor will be required to demonstrate spool fitment.

B. Spool shall be labeled "Flow Meter Spacing Tool". Label shall conform to nametags specified in Section 15075; however label shall be affixed by adhesive or industrial grade double-sided tape.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions at location shown on the drawings and as directed.

B. Maintain upstream and downstream straight pipe runs as indicated in the Plans and as directed by the manufacturer.

C. Install grounding rings and gaskets as required. Ground as directed by manufacturer.

D. Wall mount remote display in control building as shown in the drawings and as directed.

E. Provide shielded signal cable as recommended by manufacturer for the outputs. All signal cable from the flowmeter vault to control cabinet shall be installed in conduit. Provide minimum 3 feet of flexible conduit near metering tube.

F. Provide power to remote display (120 VAC) as shown in the drawings and as specified. Provide flexible conduit near converter.

G. The manufacturer or authorized factory representative shall provide a minimum of one (1) day training and startup service to ensure installation and operation as required.

H. Verify that flow reading is accurate using approved device and method.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for flow meter and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 13425 – DIAPHRAGM SEAL & PRESSURE GAUGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specifications for the diaphragm seal, isolation valve and pressure transmitter/gauge assemblies for discharge pressure monitoring.

1.02 SUMMARY

A. The diaphragm seal shall be a wafer type isolation ring with a flexible inner cylinder separating the process flow from the inner fill fluid. Isolation ring shall have an integral isolation valve to isolate the pressure gauge from the diaphragm seal.

B. The transmitter pressure gauge shall be a lower connected, stainless steel gauge and provide a 4-20 mA output signal.

C. The diaphragm seal, isolation valve, pressure gauge and internal pressure transmitting fluid shall be provided as a fully factory assembled unit, filled and ready for installation.

1.03 QUALITY ASSURANCE

A. Manufacturer shall specialize in pressure and temperature instrumentation and shall have been providing diaphragm seals and pressure gauges for a minimum of 5 years. Entire unit, including diaphragm seal, isolation valve and pressure gauge shall be shipped as a single package from the manufacturer.

B. Pressure gauge shall have an ASME B 40.1 Grade 1A, 1% accuracy full scale.

1.05 WARRANTY

A. Warranty shall meet the standard warranty requirement as outlined in the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer or as otherwise shipped and protected by the manufacturer.

B. Store equipment in a clean dry area indoors in accordance with manufacturer's instructions. Keep containers sealed until ready to use.

C. Protect equipment during handling and installation to prevent damage or contamination.

PART 2 PRODUCTS

2.01 MANUFACTURERS & MODELS.

A. The diaphragm seal shall be Ashcroft Iso-Ring Type 80 wafer type with integral needle valve; or approved equal.

B. Pressure gauge/transmitter shall be Ashcroft Type 2279, lower mount; or approved equal.

2.02 CONSTRUCTION

A. Wafer Type Diaphragm Seal

1. The assembly flange shall be 316 stainless steel and housing shall be carbon steel. Inner flexible wall shall be Viton. Instrument connection shall be ½ -inch NPT. Filling fluid shall be glycerin.

2. Isolation ring diaphragm seal shall be equipped with an integral threaded needle valve to permit the removal of the pressure gauge without stopping the process flow or draining the fill fluid. Needle valve shall be capable of acting as a snubber by adjusting valve to "nearly closed" position. Needle valve shall be an integral part of the diaphragm housing, "stacked" valves mounted in between housing and gauge will not be allowed. Needle shall be of bronze construction.

B. Pressure Gauge

1. The pressure gauge shall be of 316 stainless steel, all welded construction. Gauge socket material shall be 316 stainless steel.

2. Gauge shall have no stop pin to mask false zero readings. Gauge face shall have graduated scale ranging from 0-100 psi on the pump discharge. Gauge dial shall be 4 ½-inch diameter.

3. Gauge connection shall be ½ -inch NPT.

4. Output signal shall be 4-20 mA.

5. Connecting pipe nipple bend and other fittings between gauge and pipe saddle shall be 316 stainless steel.

C. Isolation Ring diaphragm seal, isolation valve, and pressure gauge shall be provided as a single unit, factory filled with glycerin and ready for installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions at location shown on the drawings and as directed.

B. Provide all materials necessary for complete and functional installation.

C. Signal wire from gauge output shall be routed through conduit to control building. Individual pressure displays shall be provided in control building, locate in accordance with drawings or as directed.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for diaphragm seal, pressure gauge and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

DIVISION 15- MECHANICAL
TABLE OF CONTENTS

SECTION 15050 – BASIC MECHANICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 GENERAL INFORMATION

A. Contractors shall become informed of all conditions under which this work is to be done. No monetary allowance shall subsequently be made because of any errors due to not becoming informed and familiar with the project.

B. Data given in the specifications and on the drawings are as exact as could reasonably be identified. Their extreme accuracy is not guaranteed. Drawings and Specifications are for the assistance and guidance of the Contractor; exact distances, levels and grades will be governed by the confines or the existing building.

C. Mechanical materials shall be installed in a neat and workmanlike manner. Building and process piping, ductwork, and other conduits shall be properly secured and supported. Equipment shall be installed as specified and in conformance with the equipment manufacturer's recommendations and instructions. Vibrating equipment shall be installed with suitable vibration isolators to protect equipment and supporting structures from long-term damage. Lack of detail in drawings or specifications shall not relieve the Contractor of his responsibility to properly install, secure and support equipment and appurtenances.

1.02 STANDARDS AND CODES

A. Applicable Federal, State, County and Local Codes and Standards are the minimum requirements for materials and labor practices not otherwise stated. Nothing in the Plans or Specifications shall be construed or are intended to permit materials or installation not conforming to the above referenced authorities. The "Oregon State Plumbing Code" shall govern building services piping and plumbing.

1.03 FEES

A. Contractor shall obtain and pay for all permits and fees required by governing agencies having jurisdiction over this work. Work shall not begin until proper building permits are obtained and posted.

B. Contractor shall secure and pay for all inspections and tests required by Governmental or Utility Codes or ordinances prior to, during, and at the completion of this work. Contractor shall coordinate required inspections at the proper times without causing delays in work or progress.

1.04 SUBMITTALS

A. Shop Drawings. Contractor shall submit five copies to Engineer to be reviewed prior to construction or installation of work. Including, but not limited to:

1. Process or special unit piping.
2. All mounting brackets, standoffs, and supports used for piping, valves, and all mechanical fixtures.
3. Special valves and equipment.
4. Soil and drain plumbing fixtures floor or wall mounting.
5. Other submittals as required in specific Division 15 Sections.
6. See also requirements of Division 1.

1.05 QUALITY ASSURANCE

A. Division 15 materials and equipment shall be installed by qualified workers with experience specific to the items being used and methods of installation being required in the work.

B. Contractor shall obtain manufacturer's instructions for equipment and carefully review before performing work. Contractor shall also be familiar with referenced standards pertaining to installation methods and materials. Project drawings, specifications, approved shop drawings, and manufacturer's instructions shall be kept on site and adhered to.

1.06 WARRANTY

A. The Contractor shall assume full responsibility for and warrant for one year (after final acceptance) the satisfactory performance of all mechanical systems.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 TESTING

A. Contractor shall make tests of any portion of the installation as required by Engineer to determine if it is in accordance with these specifications.

B. Should any piece of apparatus or any materials or work fail in any test immediately remove and replace. Portion of work replaced shall again be tested by Contractor with no additional cost to owner.

C. Enclosed piping to be tested before concealing.

D. All tests shall be made in the presence of the Engineer.

E. Testing of building plumbing

1. Test all new plumbing system in the presence of the Plumbing Inspector and the Engineer. Provide ample advance notice of test dates. Provide all equipment, material and labor necessary for inspections and tests and repair all work not passing tests. After repairs are made, tests shall be repeated until each entire system is found satisfactory to the above authorities. Carry out tests prior to concealing, insulating or backfilling over any piping. No exceptions will be made.

2. Provide all equipment, material and labor necessary for inspection and tests, and repair all work found defective. Test pressure gauges must be of high quality and properly certified. Provide safety equipment to prevent accidental over-pressurization. After repairs are made, repeat tests until entire systems are found satisfactory.

3. All domestic water pressure piping; Hydrostatic test 150 psi for a minimum of 2 hours without drop in pressure. Exclude hot water heater from test.

4. All DWV piping; fill system with water to a point not less than 10 feet above the highest point in the system being tested. Water shall be held at that level for a

period of not less than 30 minutes. The system shall prove leak free by visible means.

F. Hydrostatic Testing of Process Water Piping. Fill process piping with potable water to a pressure of 150 psig. System must hold test pressure for a minimum of 2 hours with no drop in pressure. All leaks shall be corrected.

3.02 CLEANING

A. Equipment, fixtures, piping and all other materials furnished under this Division shall be cleaned, free from all rust, scale and dirt before covering or painting, or systems put into operation.

B. After completion of the work, all debris shall be removed, leaving entire work complete and undamaged.

3.03 CUTTING AND PATCHING

A. Necessary cutting and patching for installation of plumbing system included in this work. Work shall conform to applicable portions of project specifications. No cutting of structural members without prior written approval by Engineer.

3.04 PAINTING

A. Pipes, and all fittings including hanger rods, etc., not of stainless steel, shall be primed and painted per Division 9.

B. Shop pre-assembled equipment shall conform to painting specifications - Division 9, and shall be "touched up" or repainted if damaged during construction.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for basic mechanical materials, methods and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 15060 – HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Piping shall be supported, in general, as described hereinafter and as shown by the pipe support details on the Drawings. Manufacturer's catalog figure numbers are typical of the types and quality of standard pipe supports and hangers to be employed. Special support and hanger details may be shown to cover typical locations where standard catalog supports are inapplicable.

B. The Contractor shall select and design all piping support systems within the specified spans and component requirements. Structural design and selection of support system components shall withstand the dead loads imposed by the weight of the pipes filled with water, plus any insulation. Commercial pipe supports and hangers shall have a minimum safety factor of 5.

C. No attempt has been made to show all required pipe supports in all locations, either on the drawings or in the details. The absence of pipe supports and details on any drawings shall not relieve the Contractor of the responsibility for providing them throughout the plant per accepted practices.

D. All support anchoring devices, including anchor bolts, inserts and other devices used to anchor the support onto a concrete base, roof, wall, or structural steel works, shall be of the proper size, strength and spacing to withstand the shear and pullout loads imposed by loading and spacing on each particular support.

E. Where piping connects to equipment, it shall be supported by a pipe support and not by the equipment. A pipe support or hanger shall be installed adjacent to each pipe fitting or in-line device such as a valve or meter for all piping larger than 4-inch.

1.02 REFERENCES

A. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel

B. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip

C. ASTM A653 - Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process

D. ASTM A1011 – Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability *(Formerly ASTM A570)*

E. MSS SP58 - Manufacturers Standardization Society: Pipe Hangers and Supports-Materials, Design, and Manufacture

F. MSS SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports-Selection and Application

G. NFPA 13 - Standard for the Installation of Sprinkler Systems A. ASTM A167- Standard specification for Stainless and Chromium-Nickel steel plate, sheet and strip.

H. ASTM D4385 – Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products.

I. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

J. ASTM E84 - Test method for Surface Burning Characteristics of Building Materials.

K. ASTM F569 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

L. AISI – American Iron and Steel Institute

M. UL94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.03 QUALITY ASSURANCE

A. Hangers and supports used in fire protection piping systems shall be listed and labeled by Underwriters Laboratories.

B. Steel pipe hangers and supports shall have the manufacturer's name, part number, and applicable size stamped in the part itself for identification.

C. Hangers and supports shall be designed and manufactured in conformance with MSS SP 58.

D. Supports for sprinkler piping, if required, shall be in conformance with NFPA 13.

1.04 SUBMITTALS

A. Detailed shop drawings of all supports, including support anchoring devices, shall be supplied with the submittals specified herein.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver material carefully to avoid breakage and scoring finishes. Do not install damaged equipment.

PART 2 PRODUCTS

2.01 MANUFACTURER AND TYPE

A. Pipe Floor Supports. Horizontal piping pedestal supports shall be adjustable supports attaching to flanges or pipe stanchion saddles with U-bolts or clamps as shown in drawings.

1. Supports shall have a neoprene liner to isolate the pipe from the support and protect the PVC piping.

2. Support pipe shall be Schedule 40 galvanized steel cut to proper length. Supports shall be galvanized. Anchor bolts to concrete shall be stainless steel.

3. Supports used in the wetwell shall utilize sch 40 stainless steel pipe and stainless steel base, threaded top and clamp. Pipe shall be cut to size on site. Support base, pipe and top shall be fully welded to form a one-piece rigid construction.

3. Floor Supports shall be Standon model C92 or approved equal.

B. Pipe hangers for copper and plastic piping shall be coated with a plastic or neoprene protective cover. No metal portion of a hanger, support, or brace shall contact pipe directly. Use proper upper attachments and rods as required.

C. Pipe Hangers for piping less than 8-inch diameter shall be B-Line B3172C with threaded rod, nuts and washers, or approved equal. Assembly shall be zinc plated. Install as shown in the drawings and or as required.

D. Wall Support/Clamp shall be used where shown in drawings. Strut channel horizontal support with wall mount bracket. Galvanized finish. B-Line B3064 or approved equal.

E. Offset Clamps shall be used where shown in drawings. Galvanized finish. B-Line B3148 or approved equal.

F. Piping clamps for board or panel mounted pipe, tubing or conduit shall be one-hole clamps, short straps, split-style clamps, or offset clamps as required. Provide any required furring or stand-offs necessary for clearances. Furring on PVC equipment boards, when required, shall be PVC.

G. Strut channel systems shall be used where indicated on the plans and as required for proper support of vertical and horizontal multiple piping runs and electrical raceways. The strut systems are further described as:

1. All strut channels shall be galvanized or epoxy coated. B-Line B22 or approved equal.

2. Stainless steel hardware and accessories shall be used.

3. Strut shall be 1 5/8" wide in varying heights and in combinations and arrangements as shown on the drawings.

4. Pipe clamps shall include rubber pipe cushions or isolation pads. B-Line Vibraclamp BVT or approved equal. Galvanized finish.

H. SPLIT-STYLE PIPE CLAMPS (Behringer Clamps)

1. Split-style pipe clamps shall be used where shown on the drawings and where this style provides the most suitable clamp for wall, panel, or ceiling mounting.

2. Split-style clamps include a base plate, a bottom and top "clamp half" constructed of polypropylene, and a top plate. The separate components are connected using through bolts. The resulting assembly tightly cradles a piping section between the two clamp halves.

3. Behringer clamps are available in standard and heavy duty. Heavy duty clamps are required when being attached to strut channel. For all other applications, standard clamps are acceptable, unless otherwise recommended by the manufacturer.

4. Split-style heavy duty clamps shall be manufactured by Behringer, or approved equal. Standard split-style clamps shall be manufactured by Behringer, Stauff, or approved equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify piping is level, plumb and true. Verify proper wall blocking has been installed where wall connections are required. Location of supports shall be organized in such a manner as to not interfere with access and other work.

3.02 INSTALLATION

A. Unless noted otherwise on the Drawings, horizontal pipe support or hanger spacing and hanger rod sizing for pipe shall not exceed as follows:

Pipe Size (inches)	Maximum Distance Between Supports (feet)	Minimum Hangar Rod Size (inch)
1" and less	4'	3/8"
2" to 1-1/4"	5.5'	3/8"
2-1/2" to 3-1/2"	6.5'	1/2"
4" to 5"	7'	5/8"
6"	8'	3/4"
8"	8.5'	3/4"
10"	9'	7/8"
12"	10'	7/8"
14"	15'	1"

B. The load rating for universal concrete inserts shall not be less than that of the hanger rods they support.

C. When supporting cast iron and ductile iron pipe, locate hanger rods near all joints and at each change of direction.

D. All piping shall be supported in a manner which will prevent undue strain on any valve, fitting, or piece of equipment. In addition, pipe supporters shall be provided at changes in direction or elevation, adjacent to flexible couplings, and where otherwise shown. Pipe supports and hangers shall not be installed in equipment access areas.

E. All supports and clamps shall be installed as necessary to provide a secure installation in a neat and workmanlike manner.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for basic mechanical materials, methods and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 15105 – PIPING SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section specifies ductile iron, PVC, steel, stainless steel, copper, plastic tubing, and other piping systems to be used on the project.

B. Where indicated, the Contractor may choose a piping material. Otherwise, the material referenced will be required.

1.02 REFERENCES

A. This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and the listed documents, the requirements of this section shall prevail.

References	Title
ANSI B1.1-81	Unified Inch Screw Threads (UN and UNR Thread Form)
ANSI B1.20.1-83	Pipe Threads, General Purpose (Inch)
ANSI B16.1-89	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ANSI B16.5-88	Pipe Flanges and Flanged Fittings
ANSI B18.2.1-81	Square and Hex bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws
ANSI B18.2.2-87	Square and Hex Nuts
ASTM F37-88	Standard Test Methods for Sealability of Gasket Materials
ASTM F104-88	Standard Classification System for Nonmetallic Gasket Materials
ASTM F152-87	Standard test Methods for Tension Testing of Nonmetallic Gasket Materials
AWWA C111-85	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C207-86	Steel Pipe Flanges for Waterworks Service--Size 4 In. Through 144 In.
AWWA C213-07	Fusion Bonded Epoxy Coating for Interior and Exterior for Steel Water Pipes

1.03 RELATED SECTIONS

A. Section 15110 – Valves

B. Section 15060 – Hangers and Supports

C. Section 15120 – Misc. Fittings & Specialties

1.04 SUBMITTALS

A. Contractor shall submit 3 copies of technical data for project piping. Data shall include material data, pressure rating data, location of manufacture, and other information as necessary to show complete compliance with these specifications for each type of piping used.

B. If welded piping is to be used, submit detailed shop drawings showing dimensions, pipe sizes, field weld locations, flange locations, etc.

1.05 QUALITY ASSURANCE

A. All piping shall be new, unused and completely free from defects.

B. All pipe materials made in the USA shall be given preference.

1.06 PIPING SCHEDULE

A. Where not specifically noted on the plans or otherwise specified, pipe shall be installed in accordance with the following schedule and conform to the detailed specifications for each type of pipe.

B. Contractor may, at his own discretion and expense, furnish superior piping in material and pressure rating than that specified.

C. The following schedule (Table 1) is provided indicating the piping materials to be utilized on the project.

TABLE 1
PIPING SCHEDULE

Typical Location/Use	Material Spec.	Joint/ Connections	Pressure Rating (min.)
Discharge Piping	Class 350 DI or Sch. 40 ASTM A53 Class B Steel	Ductile Flanges, Megaflange, Cast Iron Backer Flanges for Stainless Piping	150 psi
Drain Piping (1" and larger)	Schedule 40 PVC	Glued	n/a
Domestic water supply piping	Type M or K copper Schedule 80 PVC	Soldered, glued, threaded	150 psi
Vent Piping	Stainless Steel	Welded	n/a

PART 2 PRODUCTS

2.01 PVC/CPVC PIPING, SCHEDULE 40 & 80

A. Schedule 80 PVC piping shall be manufactured from Type 1, Grade 1 polyvinyl chloride compound with a cell classification of 12454 per ASTM D1784.

B. Pipe shall be manufactured in strict compliance to ASTM D1785, consistently meeting and/or exceeding the quality assurance test requirements of this standard with regard to material, workmanship, burst pressure, flattening, and extrusion quality.

C. Fittings shall be injection molded, Schedule 40 or 80 (to match pipe schedule), manufactured in strict compliance to ASTM D2467 for socket type, and D2464 for threaded type. Use threaded fitting adapters only where specifically allowed as required to connect to valves. All threaded fittings shall have stainless steel reinforcements.

D. Pipe and fittings shall be NSF Standard 61 approved for use in potable water systems.

E. Cement shall conform to ASTM F493 and SCAQMD 1168. Cement shall be heavy-bodied, low VOC specifically recommended by the manufacturer for use in industrial sodium hypochlorite applications. Cement shall be IPS Weld-On 724 CPVC.

F. Primer shall conform to ASTM F656 and SCAQMD 1168. Primer shall be IPS Weld-On P-70, Purple.

G. Teflon tape shall conform to MIL spec P-27730A.

H. Piping shall be NSF approved.

2.02 DUCTILE IRON PIPING

A. Pipe shall be Ductile Iron Pipe (DIP), Grade 60-42-10 minimum, size and end configurations as shown in the drawings. Pressure Class 350 minimum thickness.

B. DIP shall be manufactured in accordance with ANSI/AWWA C151/A21.51 under method of design outlined in ANSI/AWWA C150/A21.50. Flanged sections shall also conform to ANSI/AWWA C115/A21.15.

C. Internal Lining. All ductile iron pipe shall be lined and seal coated with ceramic epoxy coating such as Protecto 401, factory applied. Dry film thickness shall be 40 mils nominal. Joint Compound (Protecto or equal) shall be applied by brush and in accordance with manufacturers recommendations.

D. External Coating. All DIP that will be buried or exposed to process water/wastewater on the pipe exterior shall be asphaltic seal coated on the exterior in accordance with ANSI/AWWA C151/A21.51. Interior DIP, and exterior DIP exposed to view and not subject to submergence, will require painting and may be supplied factory primed and without asphaltic coating.

E. Pipe shall be made in the USA and shall not have been refurbished or reworked by anyone other than the manufacturer.

F. Provide proper spool lengths from factory with plain and flange ends as required. If field cutting is required, follow manufacturer's instruction and coat cut pipe end.

G. Pipe shall be manufactured by American Cast Iron Pipe Company, Pacific States Cast Iron Pipe Co., US Pipe, or approved equal.

2.03 DUCTILE IRON FITTINGS

A. Fittings shall conform to ANSI/AWWA C110/A21.10 Standard (full body), or ANSI/AWWA C153/A21.53 (compact), with a 250 psi minimum working pressure.

B. Where shown in the project drawings, provide bosses on fittings at locations shown.

C. Fittings shall be factory coated with ceramic epoxy on the inside, Protecto 401, or equal. Exterior of fittings shall have an asphaltic coating in accordance with ANSI/AWWA C110/A21.10. Fittings to be installed in building interior and painted shall be supplied with primer instead of asphaltic coating.

D. Mechanical joint fittings shall be produced in the USA in accordance with all applicable terms and provisions of ANSI/AWWA C153/A21.53 (or C110) and ANSI/AWWA C111/A21.11. MJ gasket material shall be SBR rubber. T-bolts shall be Cor-Ten or other approved high strength, low alloy steel in accordance with ANSI/AWWA C111/A21.11 (current revision).

E. Flanged fittings shall be manufactured in the USA of ductile iron in accordance with all applicable terms and provisions of ANSI/AWWA C110/A21.10. Flanged surface shall be faced and drilled in accordance with ANSI Class 125 B16.1. Nominal body thickness shall not be less than as specified in ANSI/AWWA C153/A21.53. Misalignment of bolt holes of two opposing flanges shall not exceed 0.125 inches.

1. Flange assembly bolts shall be ANSI B18.2.1 standard square or hexagon head carbon steel machine bolts with ANSI B18.2.2 standard hot pressed hexagon nuts. Threads shall be ANSI B1.1, standard coarse thread series; bolts shall be class 2A, nuts shall be Class 2B. Bolt length shall conform to ANSI B16.5. Flange assembly bolts and nuts shall be made of noncorrosive high-strength, low-alloy steel as specified in ANSI/AWWA C111/A21.11.

2. Flange gaskets shall be full-face with holes to pass bolts. Gasket material shall be neoprene rubber conforming to ASTM D2000, SAE J200, 1/8-inch thick.

F. Mechanical joints shall be positively restrained using MegaLugs, by EEBA Iron, or approved equal. Mechanical joints with retainer glands alone will not be acceptable on this project.

G. Flange and Mechanical Joint fittings shall be by Tyler Pipe, Union Foundry Company, US Pipe; or approved equal.

2.04 FIELD FLANGE FITTING

A. Restrained flange coupling adapters shall be used on the project in lieu of factory flanged spools only where indicated on the plans and approved.

B. Other types of field flanges will not be allowed on the project.

C. Restrained flanged coupling adapters shall be Mega-Flange by EEBA Iron, or approved equal.

2.05 STAINLESS STEEL VENT PIPING

A. Use where shown on drawings or as specified in Contract Documents.

B. Pipes shall be manufactured from ASTM A240 sheets and plates in accordance with ASTM A778 in 304L or 316L stainless steel.

C. Pipe minimum wall thickness shall be schedule 10S nominal.

D. Piping shall be provided in plain-end configuration in preparation for butt weld fittings.

E. Finish shall be No. 1 H.R.A.P. (Hot Rolled Annealed and Pickled) or better.

F. Fittings shall be butt weld type manufactured in accordance with ASTM-A-774 of the same grade (alloy) and in the same wall thickness as the pipe.

G. Fittings shall match pipe wall thickness. Minimum wall thickness shall be schedule 10S nominal.

H. Welding of pipe and fittings shall be performed using welders and procedures qualified in accordance with ASME Section IX. Piping and fittings with wall thicknesses up to and including 11 gauge (0.125") shall be TIG welded. Heavier walls shall be beveled and TIG welded in multiple passes. Filler metal shall be of equal or superior grade to parent metal. Weld cross section shall be equal to or greater than parent material thickness. Weld concavity, undercut, cracks, crevices, or pitting shall not be allowed. Butt welds shall have full penetration to the interior surface.

I. After fabrication, exterior welds shall be manually scrubbed and/or brushed with non-metallic pads or stainless steel wire brushes to remove weld discoloration, rinsed with clean water and allowed to air dry.

J. Extreme care shall be taken to avoid contact between ferrous materials with the stainless steel piping. All saws, drills, files, grinders, brushes, etc. shall be used for stainless steel only.

K. Contractor shall paint all exposed steel or iron flanges, and other fittings, in accordance with Section 09900. Stainless steel pipe shall remain unpainted.

L. All markings shall be removed from stainless steel pipe by Contractor to provide a consistently clean surface.

2.06 BRASS/BRONZE FITTINGS

A. Red brass pipe nipples and piping shall be seamless, MIP threaded, rated for 150 psi working pressure, and conforming to ASTM B43 and ASTM B687. Bronze fittings shall meet the requirements of ASTM B62 with NPT threaded ends conforming to ANSI/ASME B16.15.

2.07 COPPER WATER PIPING

A. Type K or M, copper tubing conforming to the requirements of ASTM B-88 unless otherwise specified.

B. Joints shall be soldered and threaded as required.

1. Solder to be used in copper piping shall be ASTM B32, Alloy Grade Sn95 or Silverbrite 100.

PART 3 EXECUTION

3.01 PREPARATION

A. Ensure that piping is properly installed and supported. Verify end connections as required on the drawings. Verify dimensions required for installations.

B. Verify that piping has not been damaged in shipping or storage.

3.02 GENERAL INSTALLATION

A. Install piping per manufacturer's instructions. Properly brace and support as directed.

B. Follow appropriate pipe joining specifications for various MJ, Flange, solvent welded and threaded ends.

C. All piping shall be cleaned and flushed prior to start of testing.

D. All piping shall be leak tested in accordance with Section 15050.

E. Potable water piping shall be flushed and disinfected in accordance with the requirement of the Oregon Department of Human Services, Drinking Water Program and OAR 331-061-050, and Section 15050.

3.03 FLANGED JOINT INSTALLATION

A. Furnish the gaskets required for each flange joint being assembled. Gasket material for flanged joints shall be 1/8-inch thick commercial neoprene sheet conforming to ASTM D2000, SAE J200 and 1 BC 609. For 12-inch and smaller pipe, gasket shall be full face cut with holes to pass bolts. For 14-inch and larger pipe, gasket shall be ring type.

B. Flanged joints shall be fitted so the contact faces bear uniformly on the gasket. Bolts shall be tightened progressively in a sequential, uniform manner to torque values recommended by the manufacturer of the flange or fitting. Flanged fittings shall be properly anchored, supported, or restrained during installation to prevent bending or torsional strains at the connection during and after the joining process.

3.04 MECHANICAL JOINT INSTALLATION

A. Joints and gaskets for mechanical joints shall conform to ANSI/AWWA C111/A21.11 Standard. Furnish gaskets and hardware necessary for each mechanical joint.

B. The pipe shall be inserted in the socket and supported as necessary to keep the pipe centered in the joint and to maintain uniform exposure of the gasket recess. The gasket shall be pressed firmly and evenly into the gasket recess prior to installing the bolts through the gland. Bolts shall be tightened progressively in a sequential, uniform manner to torque values recommended by the manufacturer of the fitting. The gland shall not be allowed to deform during the tightening process. Any required minor deflection of joints shall be made after the joint is assembled, but before final tightening of the bolts. The jointing procedure shall be repeated if effective sealing is not attained at the maximum torque. Bolts shall be tightened to manufacturer's specifications. Bolts shall not be overstressed to compensate for ineffective sealing or poor installation practice.

3.05 PRESSURE TESTING

A. All pressure and leak testing shall be conducted by the Contractor in the presence of the Engineer.

B. Testing shall not be commenced until all thrust blocking has been in place for not less than 10 days and sufficient backfill has been placed to prevent pipe movement.

C. Test Procedure

1. The test section shall be filled with water and all air expelled from the pipe prior to testing. Contractor shall coordinate with the City to obtain water for testing.

2. All valves isolating the test section shall be securely closed and the specified test pressure applied by means of a pump connected near the lowest point of the test section. All open pipe ends shall be plugged using blind flanges or restrained plugs, as applicable.

3. The test pressure shall be 150 psi and the duration shall be at least 1-hour at the test pressure. No pressure drop is allowed during the test. No visible signs of leakage will be allowed at any exposed pipe, fitting or joint.

4. Contractor shall repair or replace any defective piping or fittings at no additional cost to the Owner. Repeat pressure tests until entire system is found satisfactory.

D. All visible leaks on new pipelines shall be repaired, regardless of the amount of leakage.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for piping systems, fittings and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 15110 – PIPELINE APPURTENANCES

PART 1 GENERAL

1.01 SUMMARY

A. The work in this Section consists of furnishing all labor, materials, equipment and performing all work necessary for the proper installation of pipe appurtenances indicated on the Plans and/or required for the completion of the proposed pump station and forcemain improvements.

B. Pipe appurtenances may include, but are not necessarily limited to the following:

a. Fittings (bends, tees, etc.)
b. Valves and Valve Boxes
c. Concrete Thrust Blocking

C. All water pipe fittings and appurtenances (including rubber gaskets) shall be made in the USA, shall be UL listed and FM approved.

D. Appurtenance Submittals – Three (3) copies of drawings and/or brochures for all appurtenances to be installed, whether as specified or a proposed substitution, shall be submitted to the Engineer for approval prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ductile Iron Fittings

1. Special note shall be taken of the various end configurations (MJ, flange, etc.) of fittings, valves, and other appurtenances as indicated in the Plans for various installation connections to existing and new materials. Thrust blocking as specified shall be installed at all fittings. Contractor may use full body or compact mechanical joint fittings, provided that the minimum pressure rating and other specifications are met.

2. All bends, tees, crosses, reducers, caps, plugs, sleeves, connectors, laterals, "Y" branches, and all other non-valve fittings shall be Protecto 401 (or equal) lined in accordance with specification included in Section 02509-2.02 Interior Pipe Lining.

3. Joints and gaskets for mechanical joint fittings shall be of domestic manufacture and conform to ANSI/AWWA C111/A21.11 Standard. Fittings shall conform to ANSI/AWWA C110/A21.10 Standard (full body), or ANSI/AWWA C153/A21.53 Standard (compact), with 250 psi working pressure minimum requirement. Furnish with ductile iron "T" head bolts and hexagonal nuts conforming to AWWA C111.

4. Flanged fittings shall be faced and drilled to standard 125-pound template per ANSI B16.1 Standard, unless otherwise specified, indicated, or required to connect to other materials. Fittings shall conform to ANSI/AWWA C110/A21.10 and/or ANSI B16.1, Class 125, and be short-body style unless otherwise indicated. Flanged fittings shall have a 250 psi minimum pressure rating. Gasket material for flanged joints shall be commercial neoprene sheet

conforming to ASTM D2000, SAE J200, 1 BC 609, 1/8-inch thick. For 12-inch and smaller pipe, gasket shall be full face cut with holes to pass bolts. For 14-inch and larger pipe, gasket shall be ring type. Furnish with coarse thread cadmium plated nuts and bolts conforming to ANSI B18.2 and B1.1 American Standards for Class 2A and 2B fit. Stainless steel nuts and bolts will be allowed.

5. Mechanical joint and flange joint fittings shall be as manufactured by Tyler Pipe; Union Foundry Company; Pacific States Pipe; Stockham: U.S. Pipe; or approved equal.

6. Joint restrainers for MJ fittings shall be Megalug manufactured by EBAA Iron, Inc. designed specifically for pipe material used. Use on all mechanical joints.

7. All blind flanges for pipe of 12-inch diameter and larger shall be provided with lifting eyes in the form of welded or screwed eye bolts attached to the edge of the flange. Eye shall be located such that it is at the exact top center of blind flange when mounted on a horizontal pipe. Certification of eye tensile strength shall be provided.

B. Couplings – All couplings shall be supplied with cadmium plated bolts or stainless steel bolts and other hardware conforming to nuts and bolts specified for flanged fittings. Contractor shall verify outside diameters (O.D.) of pipes to be connected prior to ordering couplings. Supply with standard shop coat enamel coating. Use only where specified on Plans.

1. Transition, reducing, and straight couplings, 2-inch through 12-inch, shall have cast ductile iron or carbon steel body, and resilient gaskets. TPS Hymax 2000 Series; Romac 501; or approved equal.

2. End caps couplings, 3-inch through 12-inch, shall have cast ductile iron sleeves, end rings and end caps, and resilient gaskets. Smigh-Blair 482; Romac EC501; or approved equal.

3. Flange coupling adapters, 3-inch through 12-inch, shall have cast iron body and end ring, and resilient flange and coupling gaskets. Smith-Blair 912; Romac FCA501; or approved equal.

4. Flange by mechanical joint (Flg x MJ) adaptors, 3-inch through 20-inch, shall have ductile iron bodies and joints conforming to applicable fitting specifications herein. Tyler; Union Foundry Co.; or other approved pipe/fittings manufacturer.

5. Couplings, ½-inch through 2-inch, for IPS pipe shall be compression type with rubber gaskets. Body shall be at least 3 ¾-inches long and constructed of galvanized carbon steel, with ASTM A 47 malleable iron nuts. Smith-Blair 522; Romac 702; or approved equal.

C. Galvanized Pipe Fittings – Galvanized pipe fittings shall be 150-pound standard malleable iron screwed fittings, rated for 300 psi non-shock cold water, oil or gas (W.O.G.) pressure minimum. Fittings shall meet Federal Specification WW-P-521, shall be UL listed and conform to:

Material	- ASTM A 197-87
Dimensions	- ASA B16.3
Threads	- ASA B2.1
Galvanizing	- ASTM A 153-82(87)

D. PVC Drain Waste Vent Fittings – PVC molded DWV fittings shall be a minimum Schedule 40, solvent weld unless otherwise stated. Fittings shall be manufactured in compliance to ASTM D 2665, ASTM D3311, ASTM F 1866, ASTM D 1784 and shall be certified to NSF Standard 14 and the Uniform Plumbing Code.

E. Eccentric Full-Port Plug Valves

1. Eccentric Plug Valves shall be of the tight closing, resilient faced non-lubricating variety and shall be of eccentric design such that the valve's pressure member (plug) rises off the body seat contact area immediately upon shaft readaptation during the opening movement. Valves shall be drip-tight at the rates pressure and shall be satisfactory for applications involving throttling service as well as frequent or infrequent on-off service. The valve closing member should rotate approximately 90° from the full-open to full-closed position and vice-versa.

2. The valve body shall be constructed of cast iron conforming to ASTM A 126, Class B. Body ends shall be flanged with dimensions, facing and drilling in full conformance with ANSI B 16.1, Class 125. Mechanical joint to meet the requirements of AWWA C111/ANSI A21.11.3.

3. Port shall be minimum 80% of full pipe area.

4. Valve plug shall be constructed of cast iron conforming to ASTM A126, Class B. The plug shall have a cylindrical seating surface that is offset from the center of the plug shafts. The plug shafts shall be integral. The portion of the plug in the valve body shall be fully encapsulated with Buna-N rubber. Rubber compound shall be approximately 70 (Shore A) durometer hardness. Rubber to metal bond must meet ASTM D-429-73 Method B.

5. Plug shaft seals shall be adjustable. All packing shall be replaceable without removing the bonnet or actuator and while the valve is in service. Shaft seals shall be Buna-N.

6. Manual valves shall have worm gear type actuators with handwheels or 2" square nuts.

7. Valve end configurations and sizes as shown on Plans.

8. Buried valves shall be furnished with a cast iron valve box as specified herein, and shall have operators designed for direct bury service. Furnish with a stem extension such that the operating nut is within 30-inches of the ground surface. Furnish hand wheel operators for all non-buried valves, including valves in vaults.

9. Valves shall be Clow, M&H, Kennedy; or equal.

F. Swing Check Valves (4" – 12")

1. Swing Check valves, 4-inch through 12-inch, shall be iron body, full opening swing type. Valve clapper shall swing completely clear of the waterway when valve is full open, with open flow area equal to nominal pipe diameter.

2. Check valves, 4-inch through 12-inch shall be rated at 175 psi water working pressure and 350 psi hydrostatic test for structural soundness. Seat tightness at rated working pressure shall be in accordance with values shown in AWWA Standard C-500 for gate valve and fully conform to AWWA C508. Check valves shall be UL listed and FM approved.

3. Cast iron shall conform to ASTM-A-126 Class B. Casting shall be clean and sound without inclusion or defect that will impair service. Furnish with fusion bonded epoxy meeting ANSI/AWWA C550 standard.

4. Clappers shall be cast iron and rubber faced. Hinge pins shall be 18-8 stainless steel.

5. Check valves shall be constructed to permit top entry for complete removal of internal components without removing the valve from the line. Glands shall be O-ring type.

6. Check valves shall be equipped with external lever and adjustable weight. Provisions shall be included to allow addition of spring assist assembly in the field.

7. Check valves shall be equipped with external limit switches to indicate a "valve open" condition or "valve closed" condition. See Division 16.

8. Bosses shall be provided on check valves for NPT taps. Bosses shall be provided at locations conforming to the Manufacturers Standardization Society Specification SP-45-1953. For 10-inch check valves, provide 1 ½" NPT tap at locations C and D, as defined in SP-45-1953. Provide galvanized malleable iron, square head pipe plug, rated for minimum 125 psi and conforming to ANSI/ASME B16.4 and ASTM A126 Class A; or approved equal.

9. Check valve end configurations and sizes shall be as shown on the Plans.

10. Joint materials, nuts and bolts for mechanical and flange joints shall be as specified in Section 02514-2.01.A.

11. Check valves shall be manufactured in the United States.

12. Check valves shall be as manufactured by Clow; M&H; Kennedy, American Flow Control; or approved equal.

G. Bronze Gate and Globe Valves (½" Through 3")

1. Bronze valves shall be Class 150 globe style or non-rising stem solid wedge gate style. Angle style where shown or required. Threaded or union bonnet. Threaded ends.

2. Body and bonnet shall be ASTM B61 or 62 bronze. Disc shall be bronze or Teflon. Handwheel shall be bronze or malleable iron. Stem shall be brass or copper-silicon bronze. Packing shall be non-asbestos Kevlar/Teflon or plastic/graphite.

3. Valves shall be manufactured by Red White Valve, Stockham, Kennedy; or approved equal.

H. Valve Boxes

1. Cast iron valve boxes with PVC extensions shall be furnished and installed with all buried gate valves. See standard detail drawing.

2. Valve box shall have a single piece top section and separate cover. Box and cover shall be manufactured from ASTM A48, Class 30 cast iron and shall be

rated for H20 traffic loading. Cover shall have "S" or "SEWER" formed in the casting.

3. Box shaft shall be 18-inches long with a 7-inch I.D. and 7½-inch O.D. Top flange of box shall be 12-inches in diameter. Cover shall be 7¾-inch diameter.

4. A PVC extension shall be placed at the valve extending to within 6-inches of the ground surface. The cast iron valve box is placed over this PVC extension. The PVC section shall be 6-inch diameter PVC, ASTM D3034, SDR35.

5. A hole shall be drilled through the cast iron box section to bring a length of toning wire into the box in accordance with the standard detail drawing.

6. Valve box assemblies shall be set such that the completed assembly is straight and plumb. The completed valve box assembly shall be centered over the operating nut of the valve and shall not transmit shock or stress to the valve, operating nut, or valve operator extension. Valve box assembly shall be kept free of rocks and other debris for the duration of the project. Valve box assembly shall be set flush with finish grade during final surface finishing.

7. Cast iron valve boxes shall be Olympic Foundry, Inc. VB-910; or approved equal.

I. Thrust Blocks – Furnish and place thrust blocks, sized as shown on the Plans, using portland cement concrete conforming to ASTM C94 and which develops a 28-day compressive strength of at least 3,000 psi.

1. If, in the opinion of the Engineer, the undisturbed earth against which the bearing surface has been established is compromised by the adjacent trenches or excavations, the contractor shall, as directed by the Engineer, excavate additional material as required to establish a new bearing surface that is consistent with the size, configuration and location of the piping.

2. The area where the blocking is to be placed shall be sufficiently excavated to receive the concrete so that the proper shape and bearing surface is attained. The bearing surface shall be placed so that the pipe and fitting joints will be accessible for repair. Concrete shall in no case extend around more than one-half the circumference of the fitting at any point. Thrust blocks shall be neatly formed with plywood.

3. A 6-mil plastic sheet shall be placed between the concrete and any portions of the valve, fitting, or nuts and bolts with which the concrete comes in contact.

4. The size of thrust block shall be determined by the size, configuration, and location of the piping. Minimum bearing areas for thrust restraint are outlined in the standard details. The contractor shall not increase the size of the bearing area or volume of concrete without the approval of the Engineer. Thrust blocks with volumes of concrete that are in excess of or less than that specified for the size and configuration of the piping shall be removed by the contractor, at the contractor's expense, when directed to do so by the Engineer.

5. Concrete gravity blocking is not permitted under any circumstances.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Fitting Installation – Install fittings at the location shown or as directed by the Engineer. Handle, clean, lubricate and install fittings as specified in the appropriate sections for laying pipe. Where a cut in the pipe is necessary for inserting fittings or closure pieces, cut the pipe mechanically without damaging it or its lining and leave a smooth end at right angles to the centerline of the pipe. Dress and bevel the cut end of the pipe to remove sharp edges and projections which may damage the gasket. Any lining or coating damaged to a significant degree during the cutting process, as determined by the Engineer, shall be cause for removing the damaged section by recutting the pipe or for rejecting the pipe altogether. On the pipelines, securely anchor all tees, plugs and elbows as shown or directed to prevent movement due to thrust. Achieve anchorage only by use of approved thrust blocking or approved joint restraint.

B. Valves – Set valves in the same manner as specified in Section 02315 for pipe. Clean the face of flanges thoroughly before assembling the flanged joint. Insert the gasket and tighten the nuts uniformly around the flange. Align pipe carefully on both sides of the valve before final tightening of the flanges to avoid stressing the valve body. After installation, operate the valve from full open to full closed to ensure proper operation of the valve. Correct any malfunction in the operation of the valve. Test valve joints with adjacent pipeline. Repair any leaks as observed around the valve. Backfill around valves as specified in Section 02315 for pipe.

C. Valve Boxes – Center valve boxes and set plumb over the operating nut of the valve. Set valve boxes so they do not transmit shock or stress to the valve. Set valve box covers flush with the surface of the finished pavement or such other level as may be directed. Adjust the extensions to the proper length as required for proper installation. Backfill shall be as specified for the connecting pipeline. Correct any misalignment of valve boxes without additional expense to the Owner. Drill a minimum 3/8" hole in the wall of the upper section of the valve box, 1-inch to 2-inches below the bottom of the cover, and pass the locator wire through the hole.

D. Thrust Blocking – Provide thrust blocking, as shown or directed by the Engineer, using concrete as specified. Place the concrete blocking between undisturbed earth and the fitting to be anchored. The bearing surface shall be sized and located to adequately withstand the applied thrust force. Do not encase pipe joints or fittings with concrete. See the Plans for thrust block configurations.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Measurement and payment for fittings, including but not limited to Valves, Tees, Elbows, End Caps, Couplings, Adapters, Sleeves and Blind Flanges shall be included within the lump sum price for the Project as stated on the Bid Form. No separate or additional payment will be made for nuts, bolts, washers and other fitting related hardware or supplies. Payment for fittings shall include compensation for thrust and resistance blocking and connection to new forcemain. No additional measurement for this item will occur.

2. Payment for Valve Boxes shall be included as a portion of the lump sum bid amount stated on the Bid Form for the various valves as applicable. No additional compensation will be allowed for valve boxes.

3. Payment for Thrust and Resistance Blocking shall be included as a portion of the lump sum bid amount stated on the Bid Form for the various fittings and valves. No additional compensation will be allowed.

END OF SECTION

SECTION 15113 – VALVES AND PROCESS CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section specifies specialty valves used in the project.

B. Work includes furnishing, installing, testing, and adjusting valves for proper installation and operation.

C. Valve type, size and material for each application shall be as shown in the Plans and specified herein.

1.02 QUALITY ASSURANCE

A. All valves shall be new, unused and completely free from defects.

B. All valves of similar type shall be by a single manufacturer.

1.03 VALVE END CONFIGURATIONS

A. Valve end configurations shall be as shown in the drawings and required for the intended application.

B. Flanged valves shall be manufactured in accordance with ANSI B16.1 Class 125/150, including facing, drilling and flange thickness.

PART 2 PRODUCTS

2.01 BRONZE GATE AND GLOBE VALVES

A. Bronze valves shall be Class 150 globe style or non-rising stem solid wedge gate style. Angle style where shown or required. Threaded or union bonnet. Threaded ends.

B. Body and bonnet shall be ASTM B61 or 62 bronze. Disc shall be bronze or Teflon. Handwheel of malleable iron. Stem of copper-silicon bronze. Packing shall be non-asbestos, kevlar fibers with Teflon.

C. Valves shall be manufactured by Stockham, Kennedy, Red-White Valve Corp., or approved equal.

2.02 REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER

A. Reduced pressure principle backflow preventer shall prevent contamination of the potable water supply due to back-siphonage or backpressure from substances that are health or non-health hazards. The assembly shall be manufactured in the U.S. of A. The bronze body shall be configured with individually accessible top access check valves including top-mounted test cocks. The relief valve shall be bottom centered with a separate cover. The replaceable seat rings shall be glass filled Noryl and the reversible seat discs shall be silicone rubber. Shall be equipped with Y-strainer and union-end ball valves on both ends of backflow preventer body.

B. RP Backflow Preventer shall be Apollo RP40; or approved equal.

C. Enclosure shall be fiberglass, lockable, insulated above-ground enclosures designed for insulation of pipeline appurtenances. Model shall be Lox Box LB1.5 by Hubbell, color choice per owner; or approved equal.

2.03 WASTEWATER COMBINATION AIR VALVE

A. Wastewater combination air valves shall be automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure. The valve shall perform the functions of both wastewater air release and wastewater air/vacuum valves and furnished as a single body or dual body type as indicated on the plans.

B. Single body valves 4 inch and smaller shall have full size NPT inlets and outlets equal to the nominal valve size with a 2 inch inlet on 1 inch valves. The body inlet shall be hexagonal for a wrench connection. The valve shall have 3 additional NPT connections for the addition of backwash accessories.

C. Single body valve shall provide an extended body with a through flow area equal to the nominal size of the valve. Floats shall be unconditionally guaranteed against failure including pressure surges.

D. Single body valves shall have a full port orifice, a double guided plug, and an adjustable treaded orifice button. The plug shall be protected against direct water impact by an internal baffle and an extended float stem. The plug shall have a precision orifice drilled through the center stem. The float shall include a sensitivity skirt to minimize spillage.

E. Valve body and cover shall be cast iron. Float, plug, guide shafts, and bushings shall be constructed of Type 316 stainless steel.

F. Backwash accessories shall be furnished and shall consist of an inlet shut-off valve, a blow-off valve, a clean water inlet valve, rubber supply hose, and quick disconnect couplings. Accessory valves shall be quarter turn, full ported bronze ball valves.

G. Valve interior and exterior shall be coated with fusion bonded epoxy.

H. Valve shall have 2" NPT inlet and 1" NPT outlet.

I. Valve shall be Val-Matic Series 801A, or approved equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Ensure that piping is properly installed and supported. Verify valve end configurations required with the drawings. Verify dimensions required for valve installations. Verify proper manual operators, extensions, etc. are on-site for valve operation.

B. Verify that valves have not been damaged in shipping or storage and are operating correctly.

3.02 INSTALLATION

A. Install valves per manufacturer's instructions. Properly brace and support valves.

B. Follow appropriate pipe joining specifications for various MJ, Flange, solvent welded and threaded ends.

C. Flush all pipelines prior to valve operation to remove all grit.

D. Operate all valves after installation to ensure smooth and proper operation. Adjust, clean, and lubricate as required.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Valves, Process Control and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 15115 – PIPE PENETRATION SLEEVE AND SEALS

PART 1 GENERAL

1.01 SUMMARY

A. The work in this Section consists of furnishing all labor and materials, and performing all work necessary for the proper installation of annular space seals.

1.02 REFERENCES

A. Section 03300 – Cast-In-Place Concrete

B. Section 02509 – Site Piping

1.03 SUBMITTALS

A. Submit product data in accordance with Section 01300.

1.04 PROJECT CONDITIONS

A. Verify all relative dimensions, pipe outside diameter and required sleeve inside diameter, before ordering product. Contractor is responsible for product fitment and function.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Sequence deliveries to avoid delays and minimize on site storage.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by the Manufacturer. Protect from sunlight, weather, excessive temperatures and construction operations.

PART 2 PRODUCTS

A. MODULAR SEALS FOR PIPE PENETRATIONS

a. Annular space between the pipe and wall shall be sealed by use of modular seals consisting of interlocking synthetic rubber links shaped to continuously fill the annular space.

b. The elastomeric element shall be sized and selected per manufacturer's recommendations and have the following properties as designated by ASTM.

c. Coloration shall be throughout elastomer for positive field inspection. Each link shall have a permanent identification of the size and manufacturer's name molded into it.

d. Modular seal links shall be black EPDM rubber suitable for use in untreated wastewater.

e. Modular seal pressure plates shall be molded of glass reinforced Nylon Polymer with the following properties: Izod Impact – Notched = 2.05 ft-lb/in. Per ASTM D-256, Flexural Strength @ Yield = 30,700 psi per ASTM D-790, Flexural Modulus = 1,124,000 psi per ASTM D-790, Elongation break = 11.07% per ASTM D-638. Specific Gravity = 1.38 per ASTM D-792.

f. All fasteners shall be 316 stainless steel per ASTM F593-95 with 85 ksi average tensile strength.

g. Modular link seals shall be manufactured by PSI-Thunderline/Link-Seal, or approved equal. Modular seal links and modular seal pressure plates shall be products of the same manufacturer.

h. Link-Seal models LS200, 275, 300 and 315 shall incorporate the most current Link-Seal Modular Seal design modification sand shall include an integrally molded compression assist boss on the top (bolt entry side) of the pressure plate, which shall permit increased compressive loading of the rubber sealing element.

i. Link-Seal models 315, 325, 340, 360, 400, 410, 425, 475, 500, 575, and 600 shall incorporate an integral recess designed to accommodate commercially available fasteners to insure proper thread engagement for the class and service of metal hardware.

B. FLEXIBLE CONNECTORS FOR PIPE PENETRATIONS

a. Connections to precast riser gravity sections shall be accurately core-drilled and shall utilize a properly sized flexible rubber boot providing a watertight seal. Adapter shall be factory tested for watertightness up to 10.8 psi. Kor-N-Seal 106 series as manufactured by NPC, Inc. or approved equal.

b. Connectors shall use stainless expansion bands, 8-inches in length.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install per manufacturers recommendations and per contract drawings.

B. Modular seals shall not be allowed to bear the weight of pipe, either during installation or anytime thereafter. Proper pipe supports shall be supplied where appropriate.

C. Center the pipe in wall opening, making sure to properly support the pipe at both ends.

D. Insert Modular Seal according to Manufacturer recommendations, do not add or remove links from the seal to reduce or increase "sag".

E. Tighten bolts starting at the 12 O' Clock position and continue in a clockwise pattern. Do not tighten any bolt more than 4 turns at a time. Continue the clockwise pattern until all links are uniformly compressed. Do NOT use electric or pneumatic tools to tighten bolts, hand tighten only, follow manufacturers recommendations. Tighten until modular sealing elements "bulge" around the pressure plates.

F. For questions regarding installation of Link-Seal modular seals call (800) 423-2410.

G. Flexible connectors shall be installed using hand tools utilizing a ½" socket wrench and preset torque limiter to 12 foot lbs.

H. Pipe shall be smoothes and inserted into the center of the connector opening and clamped to 60 inch pounds of force.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for pipe penetration seals and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 15117 – DUCK BILL CHECK VALVE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specifications for the slip-on style duckbill check valve provided for the valve vault and flow meter vault drain, air release valve manhole drain and overflow outfall.

1.02 SUMMARY

A. The duckbill check valve shall feature a soft sleeve end for slip over connection to plain pipe end and shall be fastened with stainless steel clamp(s).

1.03 QUALITY ASSURANCE

A. Manufacturer shall specialize in manufacture of valves for municipal and industrial applications.

1.05 WARRANTY

A. Warranty shall meet the standard warranty requirement as outlined in the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer or as otherwise shipped and protected by the manufacturer.

B. Store equipment in a clean dry area indoors in accordance with manufacturer's instructions. Keep containers sealed until ready to use.

C. Protect equipment during handling and installation to prevent damage or contamination.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The duck bill check valve shall be Cla-Val Series DBO, Red Valve Tideflex TF-2; Proco; or approved equal.

B. The inline check valve shall be Red Valve Tideflex Checkmate; or approved equal.

2.02 PERFORMANCE

A. Cracking pressure of 2 to 3-inch valve shall be approximately 3 inches of water or less.

B. Cracking pressure of 4 to 6-inch valve shall be approximately 6 inches of water or less.

C. Cracking pressure of 12" valve shall be approximately 6 inches of water or less.

D. Valve shall be manufactured in the closed position and shall not require backpressure for sealing.

2.03 CONSTRUCTION

A. Duck bill check valve shall be slip-on type for installation over the end of plain end pipes. Valve shall be sized for pipe O.D., Contractor to determine actual pipe diameter.

B. Valve shall be fastened to pipe using two stainless steel band clamps. Follow manufacturer's recommended torque setting.

C. Valve shall be of Ethylene-Propylene (EPDM) or Hypalon elastomer construction.

D. 12" Valve shall be inline style mounted at overflow manhole discharge location utilizing a single stainless steel clamp

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions. Mount with the bill in the vertical position for proper valve function. Do not use a lubricant to ease the installation, this may cause the valve to slip off the pipe.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for duck bill check valves and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 15120 – MISCELLANEOUS FITTINGS AND APPURTENANCES

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section contains specifications for miscellaneous fittings, components, and appurtenances that are required to provide complete installations for a number of systems required on the project.

B. Items specified in this Section include:

1. Floor drain assembly
2. Utility yard hydrant

1.02 RELATED SECTIONS

A. Section 15105 – Piping Systems

1.03 SUBMITTALS

A. Submittals shall meet the requirements of Section 01300.

PART 2 PRODUCTS

2.01 FLOOR DRAINS

A. Drain with grate to be installed in valve vault. Drain shall be 9-inch diameter, connected drain pipe shall be 3-inch.

B. Drain body shall be designed to be cast into concrete floor and shall have a threaded connection for pipe. Body to be epoxy coated cast iron with bottom outlet, and flat corrosion resistant grate.

C. Install at location shown on the drawings. Install such that top of grate is 1/8 inch below surrounding concrete slab surface.

D. Floor drain shall be Zurn Z551; or equal.

2.02 UTILITY YARD HYDRANT

A. Utility yard hydrant shall feature automatic draining when hydrant is shut off to prevent freezing. Provide minimum 2-feet of bury depth to valve.

B. All working parts shall be removable from the top of the hydrant.

C. Valve shall be operated by manual lever. Lever shall be manual close.

D. Valve body shall be brass with 1-inch FNPT threads.

E. Casing shall be 1-inch galvanized pipe.

F. Operating rod shall be minimum ¼-inch galvanized steel rod.

G. Hydrant outlet shall be 1-inch MNPT located approximately 2 feet above grade. Provide machined brass 1" NPT x 1" NPSH adapter.

H. Utility yard hydrant shall be Woodford U100; or equal.

2.03 UTILITY YARD HOSE

A. Utility yard hose shall be 50 feet long x 1-inch ID flexible hose. Couplings shall be 1-inch NPSH both ends, machined brass. Hose shall be flexible, kink resistant, 6-ply construction, minimum 300 psi burst strength.

B. Utility yard hose shall be Gilmour Flexogen; or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all equipment per manufacturer's recommendations and instructions.

B. Installation shall be performed in the arrangement and position as shown on the drawings.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for fittings and appurtenances and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 15125 – INSIDE DROP SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specifications for the inside drop system including drop bowl, drop pipe and pipe bracket.

1.02 SUMMARY

A. Inside drop system shall be installed in the pump station wetwell as shown on the Plans.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer or as otherwise shipped and protected by the manufacturer.

B. Store equipment in a clean dry area indoors in accordance with manufacturer's instructions. Keep containers sealed until ready to use.

C. Protect equipment during handling and installation to prevent damage or contamination.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The inside drop system shall be Reliner Inside Drop System by Duran, Inc; or equal.

2.02 CONSTRUCTION

A. Drop bowl shall be constructed of marine grade fiberglass.

B. Fiberglass drop bowl shall be finished in ISO gel coat.

C. Drop pipe shall be sized as indicated on the Plans. Drop pipe shall be minimum SDR 35 PVC pipe.

D. Drop pipe shall be secured to wall using clamp and bracket provided by drop system manufacturer. Clamp and bracket shall be type 304 stainless steel, 11 gauge. Hardware shall be 18-8 stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and in accordance with the Plans and Specifications. Locate as shown on plans and as directed.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Payment for Inside Drop System and other work in this section shall be included as a portion of the lump sum price for the project as stated in the Bid Form for the Project. No separate measurement for these quantities will occur.

END OF SECTION

SECTION 15762 – CABINET, UNIT AND WALL HEATERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work in this section includes furnishing and installing all cabinet, unit and wall heaters required on the project.

B. Heaters for this project include: Control Building Heater.

1.02 RELATED SECTIONS

A. Division 16 - Electrical

1.03 SUBMITTALS

A. The Contractor shall submit 3 copies of specific brochure data for each heater proposed showing electrical characteristics, construction, features, dimensions, mounting details, and control details.

PART 2 PRODUCTS

2.01 UNIT HEATER

A. Supply and install new UL listed heater to maintain control building temperatures above 45°F.

B. Heater shall be 3000 Watts with a supply voltage of 208 VAC, single phase.

C. Provide wall thermostat Lux model LV2 120/240VAC heating only; or approved equivalent.

D. Motor. 1/100 HP 1600 RPM enclosed.

E. Heater shall be wall/ceiling mount unit heater MUH-03-81 by QMark; or approved equivalent.

F. Mounting bracket shall be MMB-10 Universal Wall and Ceiling Bracket by QMark; or approved equivalent.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install heaters and accessories in accordance with the manufacturer's instructions and NEC.

B. Properly secure and support, support bracket as required. Position as shown in detail drawings.

C. Coordinate with Owner when options for mounting locations and thermostat locations exist.

D. Test heater controls for proper operation. Set thermostats as directed.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Furnish materials and provide work in this Section as a portion of the lump sum price for Electrical as stated in the Bid Form. No separate payment will be made for work in this Section.

END OF SECTION

SECTION 15810 – DUCTWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work in this section includes furnishing and installing all ductwork and accessories as shown on the Plans and specified, including but not limited to, ductwork, manufactured duct joints, casings, and flexible duct fan connections as applicable.

1.02 RELATED SECTIONS

A. Section 15830 – Fans

1.03 REFERENCES

A. ASHRAE – Fundamentals Handbook – Duct Design.
B. ASHRAE – Equipment Handbook – Duct Construction.
C. ASTM A90 – Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
D. ASTM A525 – General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
E. ASTM A527 –Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.
F. NFPA 90A – Installation of Air Conditioning and Ventilating Systems.
G. NFPA 90B – Installation of Warm Air Heating and Air Conditioning Systems.
H. SMACNA – Duct Construction Standards.
I. UL 181 – Factory-Made Air Ducts and Connectors.
J. UL 555 – Fire Dampers, UL 555C & UL 555S.
K. Uniform Mechanical Code
L. Uniform Building Code
M. SMACNA – HVAC Duct Leakage Test Manual.

1.04 SUBMITTALS

A. The Contractor shall submit 3 copies of shop drawings for the proposed ductwork layout showing plan; elevation; cross-sections; and indicating the locations of all fabricated fittings, including dampers, flexible connections, taps, and reducers.

1.05 DESIGN REQUIREMENTS

A. Ductwork

1. Design ductwork in accordance with ASHRAE and SMACNA guidelines and standards.

2. All duct construction, including sheet metal gage and reinforcement, shall follow the SMACNA HVAC Duct Construction Standards, latest edition, unless otherwise noted.

3. Ductwork for special exhaust systems shall conform to NFPA 91 and the Uniform Mechanical Code.

4. All ductwork shall be insulated to R-11 minimum.

B. Sound Attenuation – Ductwork shall be designed such that air noise and vibration are kept to a minimum.

C. Air Leakage – Comply with applicable duct sealing requirements as listed in SMACNA HVAC Duct Construction Standards.

D. Flexible Duct Fan Connections

1. Provide at least one-inch slack in connections to insure that no vibration is transmitted from fan to ductwork.

2. Exhaust ducts shall have flexible connections appropriate for the type of exhaust and NFPA/UMC requirements.

E. Elbows

1. Elbows with throat radius (measured at inside surface) equal to duct depth should be used wherever possible. Rectangular elbows are discouraged. If rectangular elbows are needed, they shall have single-wall turning vanes, with intermediate supports if the length of the vanes exceeds 36-inches. Edges of the turning vanes shall be parallel with the sides of the elbow.

PART 2 PRODUCTS

2.01 MATERIALS

A. General – All duct materials shall be non-combustible or conforming to requirements for Class 0 or Class 1 air duct materials, per UL 181 with limitations as noted in NFPA 90A.

B. Steel Ducts – Steel ducts shall be formed of ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz. per sq. ft. for each side in conformance with ASTM A90.

C. Sealant – Duct sealant shall consist of non-hardening, non-asbestos, water resistant, UL classified fire resistive sealant compatible with mating materials.

2.02 MANUFACTURED JOINTS

A. Manufactured duct joints shall consist of components of standard catalog manufacture and shall be of same brand as the duct system being installed, or approved equal.

B. Manufactured duct joints shall be formed of equal gauge metal as duct system, or as recommended by manufacturer.

2.03 FLEXIBLE CONNECTORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.

B. Flexible connectors shall be fire-resistant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Fabric shall be minimum 30 oz. per sq. yd. density, crimped into metal edging strip.

2.04 EAVE CAPS FOR EXHAUST FAN AND FRESH AIR INTAKE

A. Inlet/Outlet caps for exhaust fan shall form an airtight seal to the ducting. Caps shall have bird screens,

B. Inlet/Outlet caps shall be mounted on outside walls as shown in drawing.

C. Inlet cap shall be stainless steel down facing hood, with a 6 inch round duct connector, stainless bird/insect screen, and inlet damper.

D. Outlet cap shall be stainless steel down facing hood, with a 6 inch round duct connector, stainless bird/insect screen, and outlet damper.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install ducting and accessories in accordance with applicable portions of SMACNA HVAC Duct Construction Standards and as indicated on the approved shop drawings.

B. Properly secure and support all ductwork and accessories.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Furnish materials and provide work in this Section as a portion of the lump sum price for the project as stated in the Bid Form. No separate payment will be made for work in this Section.

END OF SECTION

SECTION 15830 –EXHAUST FAN

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section contains specifications for the ceiling fan that is to be placed into the filter room ceiling and related appurtenances.

1.02 RELATED SECTIONS

A. Division 16 – Electrical
B. Section 15810 - Ductwork

1.03 SUBMITTALS

A. Submittals shall meet the requirements of Section 01300.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ventilation fan shall be of the ceiling mount type with an air delivery of at least 150 CFM at 0.125" static pressure per HVI.

B. Sound level shall be no more than 1.6 sones per the Home Ventilating Institute (HVI).

C. Fan power consumption shall be no greater than 1.5 amps at 120 Volts.

D. Fan shall have a centrifugal blower wheel, cushioned vibration isolators for motor, permanent motor lubrication, and impact resistant blower wheels. Integrated automatic damper to prevent back draft quietly.

E. Fan to incorporate a horizontal 6 -inch duct connection port. Fan shall have a painted metal grill.

F. Fan shall be Model L150MG by Broan, or approved equal.

G. Fan shall be thermostat controlled to intake outside air on hot day. Thermostat shall be Lux LV3 120/240V cooling only thermostat; or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install per manufacturer's recommendations and instructions.

B. Installation shall be performed in the arrangement and position as shown on the drawings.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for items specified in this section shall be included as a portion of the lump sum price for the project as indicated on the Bid Form. No separate measurement for these quantities will occur.

END OF SECTION

DIVISION 16- ELECTRICAL
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SECTION 16050 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

A. Contractor shall conform to the General Conditions, Supplementary General Conditions, and related work in all other divisions and all work in Division 16. Correlation of contract requirements is the responsibility of the Contractor.

B. The Contract Documents are complimentary. What is required by any one, as affects this Division, shall be as binding as if repeated therein.

C. Separation of this Division from other Contract Documents shall not be construed as complete segregation of the work nor shall it suggest a scope of work for a Contractor or subcontractor.

D. Particular attention is called to the Bidding Information, Conditions of the Contract, and Special Specifications.

E. All deviations from the Drawings or Specifications must be approved, in writing, by the Engineer and the Owner.

1.02 WORK INCLUDED

A. It is the intention of this Section of the Specifications and the accompanying drawings to describe and provide for the furnishing, installing, testing and placing in satisfactory and successful operation 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 Plans. The work shall include all materials, appliances and apparatus not specifically mentioned herein or noted on the Plans, but which are necessary to make a complete working installation of all electrical systems shown on the Plans and described herein. Certain equipment and devices furnished and installed under other Divisions of this Contract (or by Owner) shall be connected under this Division. The drawings and specifications are complimentary and what is called for in either is as binding as if called for in both. To restate: Contractor is responsible for connecting all electrical equipment in this project, even if the connections are not described or detailed on the drawings or specifications.

B. Provide equipment and installation not otherwise shown on the drawings but required by code or required to make a complete and functional electrical system.

C. Contractor shall offer electrical assistance to all other contractors.

D. Contractor shall include all programming, dialer and HMI screens setup required by the systems operators to run and troubleshoot the pump station.

1.03 WORK NOT INCLUDED

A. Equipment furnished and installed under another Division. However, electrical connection of equipment installed or furnished under another Division shall be the responsibility of the Division 16 contractor unless the task is specifically assigned in the Division documents to another contractor.

1.04 DIVISION 16 WORK DESCRIBED IN OTHER DIVISIONS INCLUDES:

A. Temporary Power. See General Requirements.

B. Mechanical control wiring and alarm wiring. See pertinent Divisions.

C. Equipment control wiring. See Division 11 and Division 13.

D. Electrical connection to all new equipment and interconnections with existing facilities, whether detailed on plans or not, is a responsibility of the Division 16 contractor.

1.05 EXAMINATION OF SITE

A. The Contractor shall visit the premises to thoroughly familiarize himself with all details of the work and working conditions and verify all dimensions in the field, and shall advise the Engineer of any discrepancy before permitting the work. The Contractor shall be specifically responsible for the coordination and proper relation of the electrical work to the building structure and to the work of other trades.

B. Owner shall not be responsible for any loss of unanticipated costs which may be suffered by the successful bidder as a result of such bidder's failure to fully inform himself in advance in regard to all conditions pertaining to the work and character of the work.

C. Field-verify scale and dimensions shown on all contract documents and drawings, since exact locations, distances and levels shall be governed by actual field conditions.

1.06 PROTECTIVE AND ACCESS REQUIREMENTS

A. Protection. Exposed parts that are subject to high operating temperatures or are energized electrically and moving parts of which are of such nature or so located as to be a hazard to operating personnel, shall be insulated, fully enclosed or guarded. Guarding shall be arranged in a manner that will not impair the proper functioning of these parts.

B. Access. Where equipment is more than 8 feet above the floor, steel platforms and ladders shall be provided where required to permit easy access for inspection and maintenance.

1.07 COORDINATION

A. The Division 16 Contractor shall coordinate his work with that of the other Contractors doing work in the buildings and shall examine all drawings, including the several Divisions of mechanical, ventilation, structural and general, for construction details and necessary coordination.

B. Special attention shall be given for the following items and all conflicts shall be reported to the Engineer before installation for decision and correction:

1. Location of radiators, grilles, pipes, ducts and other mechanical equipment so that all electrical outlets, lighting fixtures and other electrical outlets and equipment are clear from and in proper relation to these items.

2. Within the limits indicated on the drawings, the maximum practicable space for operation, repair, removal and testing of equipment shall be provided.

C. The Contractor will not be paid for cutting, patching and finishing required for relocation of work installed due to interference between the various Contractors' work.

D. Composite Interference Drawings. Before any sleeves or inserts are set or any electrical equipment or foundations are installed, prepare and submit for approval, by the Engineer, in accordance with the General Provisions, composite coordination drawings for all equipment rooms, spaces and other areas in which the probability of interference exists. Drawings shall show the work of all trades covered, shall be drawn to a scale not smaller than 1/2" = 1'-0", and shall show clearly in both plan and elevation that all work can be installed without interference.

E. Prior Installation. Any electrical work installed prior to approval of coordination drawings shall be at the Contractor's risk. Subsequent relocations required to avoid interferences shall be made without additional expense to the Owner. In case interference develops, the Engineer will decide which work shall be relocated, regardless of which was installed first.

F. Outages. Schedule any power or communication outages which may affect existing facilities with the Owner and Engineer.

1.08 CODES AND STANDARDS

A. If any conflict occurs between government adopted code rules and this Specification, the codes are to govern. Nothing in these drawings and specifications shall be construed to permit work not conforming with governing codes. Also, this shall not be construed as relieving the Contractor from complying with any requirements of the plans or specifications which may be in excess of requirements of the hereinbefore mentioned rules and not contrary to same.

B. All electrical equipment shall bear the label of the testing laboratories recognized by the State of Oregon as meeting the testing standards for minimum electrical safety.

C. All electrical systems shall be designed to the following current National Standards. 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.

1. National Electrical Code (NEC)

2. Uniform Building Code (UBC) as applicable.

D. Comply with State and any local electrical codes, safety orders, ordinances, applicable building codes, and requirements of serving utilities.

E. Materials shall, where rated, be UL listed and conform to applicable ANSI, NEMA, ISA and OSHA, or other recognized standards.

F. Design features specified or shown which are over and above requirements of relevant codes and standards shall take precedence.

1.09 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. Contractor shall make all necessary arrangements for installation of electrical services indicated on plans.

B. Contractor shall pay all communications, security and power company fees and/or costs for power installation, regardless if provided overhead, underground or rerouted.

1.10 CONTRACT DRAWINGS

A. Conduits and ground connections are shown diagrammatically only and indicate the general character and approximate location. The layout does not necessarily show the total number of conduits for the circuits required, nor are the locations of indicated runs intended to show the actual routing of the conduits. The Contractor shall furnish, install and place in satisfactory condition, ready for operation, all conduits, cables and other materials required for a complete electrical system.

B. The horsepower of motors and apparatus wattages indicated on the plans and in the panel schedules are estimated requirements of equipment furnished under other Divisions of this contract and bid shall be based on these sizes. Overload elements, contactors, circuit breakers, fuses, conductors, etc., shall be furnished to suit actual equipment installed. Advise Engineer of any equipment changes affecting electrical circuits.

C. Any minor changes in the location of the conduits, outlets, etc., from those shown on the plans shall be made without extra charge, if so directed by the Engineer before installation.

D. Contractor shall consult the architectural drawings for the exact height of all outlets not specified herein or on the drawings.

E. Outlet locations shown on the drawings are approximate. Contractor shall study the building drawings in relation to spaces and equipment surrounding each outlet so that the lighting fixtures are symmetrically located according to ceiling tile and room layout. When necessary, with the Engineer's approval, outlet shall be relocated to avoid interference with structural features of the building.

When conduit, insert or sleeves for outlet boxes and/or conduits are required, Contractor shall supply and install all conduits, inserts or sleeves and shall fully coordinate the installation thereof with other trades.

1.11 SUBMITTALS

A. Submittals shall meet the requirements of Section 01300.

B. All material shall be new and a standard product of a reputable manufacturer. Deliver to site in original factory cartons with full manufacturer's warranty. Each type of material or equipment shall be of the same manufacturer throughout the project.

C. The Contractor shall submit for approval shop drawings and cutsheets for each item and system. Furnish catalog data for all items of material, except where the information is included with shop drawings. Shop drawings shall show the ratings of items and systems and how the components of an item and system are assembled, function together, and how they would be installed on the project. Data and shop drawings for component parts of an item or system shall be coordinated and submitted as a unit.

1. Required for all electrical equipment and includes but is not limited to the following:

a. Qualification certificates

b. Contract Cost Breakdown

c. Panelboards, switchboards and breakers

d. Light fixtures, standards and appurtenances

e. Switches and receptacles

f. Motor control centers, motor starters, VFDs

g. Equipment controllers and switches

h. Disconnects and fusible switches

i. Special switches, pushbutton stations and controls

j. Those specific items called out elsewhere in the specifications which require special coordination and/or details

k. Electric heaters and thermostats

l. SCADA & Telemetry systems

m. Computer & networking equipment & PLC equipment

n. Fans and grilles

o. Raceways, wiring devices, floor boxes, wires and cables

p. Generators & Transfer switches

q. All instruments, sensors & equipment

r. Instrumentation, metering, flow, level, temperature, pressure, etc., sensing equipment

D. Single Submission. Data and shop drawings shall be supported and included in a single submission. Multiple submissions are not acceptable except where prior approval has been obtained from the Engineer. In such cases, a list of data to be submitted later shall be included with the first submission. Submit five copies in one or more 3-ring binder notebooks, vinyl covered, with proper index and dividers.

E. Context. The lists of materials and equipment shall be supported by sufficient descriptive material, such as catalogs, cuts, diagrams and other data published by the manufacturer, to demonstrate conformance to the specification requirements; model numbers alone will not be acceptable. The contractor shall submit photometric performance curves for each lighting fixture to assure proper lighting distribution and quality at the design conditions. The data shall include the name and address of the nearest service organization. All cut sheets must be marked to show the actual model of each item used and all related appurtenances with proper model and part numbers.

F. Shop Drawings. Shop drawings shall include complete construction details, dimensions, material descriptions, diagrams or pictures showing physical characteristics, performance and test data, description of operation, installation methods, wiring diagrams and any other data or information necessary for a complete evaluation. (Note: do not re-draw the

contract drawings. The drawings to be submitted under this subsection are all the supplemental drawings and manufacturers' specification drawings which are not included in the contract drawings.) Shop drawings are in addition and supplemental to the contract drawings.

G. Identification. In addition to the requirements of Special Provisions, submittals shall be identified by the name of the system and applicable specification paragraph number.

H. Delivery Prior to Approval. No item of material or equipment shall be delivered to the site or installed, until approved. After the proposed materials have been approved, no substitution will be permitted except where approved by the Engineer.

I. Compliance. Should the Contractor fail to comply with the requirements of these provisions, the Engineer reserves the right to select any or all items of materials and systems. Selection shall be final and binding upon the Contractor. Materials so selected or approved shall be used in the work at no additional cost to the Owner.

J. Departures. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons therefore, shall be submitted with the drawings. Where such departures require raceways or equipment to be supported otherwise than as shown, the details submitted shall include loadings and type and kind of frames, brackets, stanchions, or other supports necessary. Approved departures shall be made at no additional cost to the Owner.

K. Electrical Diagrams. A complete electrical connection diagram for each item of equipment furnished under Division 16, which has electrically controlled components having more than one automatic or manual control device, shall be submitted for approval. Wiring diagrams shall identify each component, and one diagram shall show all interconnected or interlocked components. It is understood that the contract electrical drawings do not have to be submitted or copied for inclusion in this submittal.

L. Contractor agrees that submittals processed by the Engineer are not change orders; that the purpose of submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use.

M. Late submittals will not be considered an excuse for time extension for the project.

1.12 SUBMITTAL RECORD DRAWINGS/ASBUILTS/O & M MANUAL (AT PROJECT END)

A. Record Drawings. Corrections and changes made to the contract drawings during the progress of the work shall be recorded in a legible hand, in red pencil, continuously on a copied set of the contract drawings kept readily available at the project under construction. The purpose of these Record drawings is to provide the Engineer with an easy to read, complete record of the installation so that at the end of the project the Engineer can revise the original contract drawings to represent the actual installation. Color-coded and highlighted notes shall be used if these would make the Record Drawings easier to read. These drawings shall also include such information as all wiring labels, conduit sizes and labels, overload sizes and accurately locate all underground and under-slab piping and stub-outs. At the completion of the work, Contractor shall furnish the Engineer this set of drawings. Final payment to the Contractor will not be authorized until these drawings have been submitted to and accepted by the Engineer.

B. Supplemental As-Built Electrical Drawings. As-Built Drawings supplementary to and not already included in the contract drawings shall be assembled and delivered to the Engineer in the form of five bound copies. The Electrical Engineer will revise the original bid drawings by information supplied by the Contractor on the Record Drawings but any other electrical equipment or connections not shown on the bid drawings or Record Drawings shall be documented by supplementary as-built drawings supplied by the Contractor.

C. The Contractor shall prepare and deliver five copies of an Electrical Equipment Maintenance Manual for all electrical equipment installed on the project. This manual shall coordinate with and be an integral part of the plant O&M manual set and plant drawings. This manual, along with the plant electrical drawings and the Software Integrator's process control manual shall compose the electrical section of the plant O&M manual set. The Electrical Engineer will provide updated plant electrical drawings at the end of the project which have been revised by the Contractor's Record Drawings. The Contractor shall be responsible for providing all other drawings. The purpose of this manual is to provide one comprehensive document which illustrates and describes all the electrical equipment and instrumentation installed in the plant. The manual shall include but not be limited to drawings and specifications for the following items as applicable to this project:

1. Motor Control Centers and all related controls, protection and appurtenances.
2. All electronic controls and all appurtenances.
3. Instrumentation devices and telemetry equipment.
4. Heating/Ventilating/Lighting equipment furnished under this Division.
5. Thermostats.
6. Electrical panel schedules and modifications to existing electrical equipment.
7. Solenoid valves.
8. Disconnects.
9. Level Controllers/Float Controls.
10. Motor starters, variable frequency drives, reduced voltage starters and similar equipment.
11. Programmable Logic Controls (PLCs) and any other computer devices and their related peripheral equipment.
12. Commented and annotated software listings of any software or programs developed under this Division uniquely for this installation.
13. Commented and annotated documentation of any programmed set points or programmable setup parameters for any programmable equipment (for example, chart recorders, VFDs, instrumentation, telephone dialers, etc.).
14. All electrical control panels supplied by equipment manufacturers.

15. All other electrical equipment or instrumentation, whether provided by the Electrical Contractor or not.

D. The manual shall be assembled in one or more white 3-ring binder notebooks with "D" style rings, each vinyl covered with a clear vinyl pouch on the outside spine and front to receive a cover title. Contractor shall insert printed spine and cover title sheets to match font style and size of the rest of the plant O&M manual set. Coordinate with the General Contractor.

E. The information contained in the manual shall be grouped in an orderly arrangement by category. It shall have a typewritten index and divider sheets between categories with identifying tabs.

F. The information included must be the exact equipment installed, not the complete "line" of the manufacturer. Where sheets show the equipment installed and other equipment, the installed equipment shall be neatly and clearly identified on such sheets. Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by the equipment supplier are not acceptable.

G. It shall contain all information presented in the post bid equipment submittal in addition to: shop drawings, equipment wiring diagrams, operating and maintenance instructions, individual equipment operating and installation manuals, replacement parts lists, and equipment nameplate data for all equipment and systems installed under the project. Electrical and/or electronic equipment data shall contain step-by-step circuit description information and printed wiring diagrams designed to provide electronic service technicians with adequate information to diagnose and repair the components on each circuit board. Electrical and/or electronic equipment submittals shall contain step-by-step signal and control description information designed to provide maintenance personnel with an understanding of equipment operation in each mode of operation. Unit Control and Motor Control Center manuals shall be included with a complete functional description of operation in narrative form for each control center function.

H. Diagrams for each system shall be complete drawings for the specific system installed under the contract. "Typical" line diagrams will not be acceptable unless properly marked to indicate the exact field installation.

I. Manuals and documentation shall include calibration curves of every sensing device and a programming documentation sheet for every programmable device. The programming documentation sheet shall show the final operational value of every programmable parameter of every device. The purpose of this sheet is to provide maintenance personnel with a convenient source of information for programming the parameters of a replacement device should the old device fail.

J. Include all electrical devices provided under all Divisions. Coordinate with other Division Contractors.

1.13 INSTRUCTION OF OWNER EMPLOYEES

A. Instruction of all electrical equipment shall be provided to insure proper use and care as well as firsthand operation of electrical equipment and components.

B. Electrical Contractor shall provide one 8-hour working day of instruction to Owner designated personnel.

C. The time for this instruction shall be scheduled shortly after start-up and at mutually agreed times. Contact Engineer for coordination.

1.14 TESTING

A. Test the entire electrical installation to assure compliance with code and proper system operation.

1. Circuit Tests. The Contractor shall test all wiring and connections for continuity and ground before any fixtures or other loads are connected. Tests shall be made with a 500 volt DC "Megger" type tester. If tests indicate faulty insulation (less than 2 megohms) such defects shall be corrected and tested again. Contractor shall provide all apparatus and material required to make tests and shall bear all expense of required testing.

2. Load Balancing. Checks shall be made for proper load balance between phase conductors and make adjustments as necessary to bring unbalanced phases to within 15% of average load.

3. Ground Testing. Measure the OHMIC value of the Electric Service Entrance metallic "System Ground" with references to "Earth Ground" using the "Multiple Ground Rod" method and suitable instruments. Maximum resistance to ground shall be less than 10 ohms. If this resistance cannot be obtained with the ground system shown, notify the Engineer immediately for further instruction. Certify in writing to the Engineer that the grounding test has been made and that the requirements of this portion have been met for the "System Ground".

4. Motor Tests. Check all motors for proper rotation and for actual load current. Submit tabulation of motor circuits.

B. Materials and instrumentation shall be provided by the Contractor.

C. The Contractor shall notify the Engineer ten (10) working days prior to performance of any test.

D. The Contractor shall certify in writing that the above tests have been completed and shall provide documentation of test data.

1.15 DEMONSTRATION OF COMPLETED ELECTRICAL SYSTEMS AND CONTROLS

A. At the point of substantial completion of the project, the Electrical Contractor shall provide necessary personnel to demonstrate the essential features of the following electrical systems:

1. Service entrance equipment.

2. Motor Control Center and all related items such as controls, alarms, software, PLC and PC equipment, etc.

3. Lighting system.

4. Heating system.

5. Ventilation.

6. Pumps, compressor, blowers, mixers, and related controls and alarm.

7. Instrumentation

B. Demonstrate each system once after all malfunctions have been corrected.

C. Time. Demonstration shall be held upon completion of all systems at a date agreed upon in writing by the Owner or his representative. This time shall be in addition to the instruction allowances provided.

D. Attending Parties. The demonstration shall be held by the Contractor and Electrical Subcontractor in the presence of the Owner or his designated representative, Electrical Engineer, Project Engineer, and the Equipment Manufacturer's representative.

E. Demonstration.

1. Demonstrate by "start-stop operation" and "automatic operation", how to work the controls, how to reset protective devices or replace fuses, and what to do in case of emergency.

2. All systems shall be exercised through operational tests in order to demonstrate achievement of the specified performance. Operational tests depend upon completion of work specified elsewhere in these Contract Documents. The scheduling of tests shall be coordinated by the Contractor among all parties involved so that the tests may proceed without delays or disruption by uncompleted work.

1.16 WARRANTY

A. Warranty materials and workmanship for a period of one year from date of final acceptance for the project or through one entire system operating season if this exceeds year date.

B. Provide written warranty for one year. Submit two written copies with Operation and Maintenance Manual.

C. Warrantee includes all material and labor to repair or replace defective items within any system, and extends to material and labor required to repair adjacent surfaces disturbed by malfunction.

D. Equipment, programming, and materials which do not achieve design requirements after installation shall be replaced or modified by the Contractor to attain compliance at no additional cost to the Owner. Following replacement or modification the Contractor shall retest the system and perform any additional procedures needed to place the complete system in satisfactory operation and attain design compliance approval from the Engineer.

E. All panel lamps shall be guaranteed for 90 days. Guarantee will become effective only after substantial completion of the project.

1.17 ABBREVIATIONS

A. The following is a list of abbreviations and terms most commonly used in the electrical industry.

A	Ampere		KV	Kilovolt
AC	Alternating Current		KVA	Kilovolt-Ampere
ATCC	Automatic Temp.		KV	Kilowatt
CC	Control Contactor		KWH	Kilowatt-Hour
AWG	American Wire Gauge		L	Lumen
BKR	Breaker		LV	Low Voltage
C	Conduit		Ma	Milliamp
CKT	Circuit		Max	Maximum
CT	Current Transformer		MC	Mech. Contractor
DB	Decibel		MCM	Thousand Circular Mils
DC	Direct Current		MECH	Mechanical
DFC	Down From Ceiling		Min	Minimum
DIAM	Diameter		MFR	Manufacturer
DPDT	Double Pole Double Throw		N	Neutral
ELEC	Electric, Electrical		OC	On Center
EC	Electrical Contractor		P	Pole
EMT	Electrical Metallic Tubing		PA	Public Address
EP	Explosion proof		PF	Power Factor
FA	Fire Alarm		PVC	Polyvinyl Chloride
FC	Footcandles		RI	Rough-In
FLR	Floor		SPST	Single Pole Single Throw
HGT	Height		SW	Switch
HP	Horsepower		TELCO	Telephone Company
HPF	High Power Factor		TTB	Telephone Terminal Board
IC	Intercom		V	Volt
ID	Ionization Detection		VFY	Verify
JB	Junction Box		W	Watt
WP	Weatherproof			

B. Reference is made to current editions and publications of the following technical societies, organizations or bodies:

ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
CBM	Certified Ballast Manufacturers
ETL	Electrical Testing Laboratories
NBFU	National Board of Fire Underwriters
NECA	National Electrical Contractor's Association
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protective Association
OSHA	Occupational Safety and Health Act
UBC	Uniform Building Code
UL	Underwriter's Laboratories, Inc.
MFR	Manufacturer
NEC	National Electrical Code / National Board of Fire Underwriters' Publication (latest adopted edition with amendments).

C. Definitions.

1. "Furnish" Deliver to the job site
2. "Install" To enter permanently into the project
3. "Provide" Furnish and install
4. "Contractor" The company responsible for accomplishing Division 16 work.

1.18 BASIC ELECTRICAL SYMBOLS

A. See drawings legend.

PART 2 - BASIC MATERIALS

2.01 GENERAL

A. General requirements for materials.

2.02 PRODUCTS

A. All materials must be of the quality herein specified. All materials shall be new, of the best quality and free from defects. They shall be designed to insure satisfactory operation and operating life in the environmental conditions which will prevail where they are being installed.

B. Each type of material shall be of the same make and quality. The materials furnished shall be of the standard products of manufacturer's regularly engages in the production of such equipment.

C. Fixtures and equipment shall be current models for which replacement items or component parts are readily available. Unless otherwise provided, all electrical items used shall be substantially the same as items of manufacturer which, on the date of opening bids, have been in successful commercial use and operation for not less than one year in projects and units of comparable size. The right is reserved by the Engineer to require the Contractor to submit a list of buildings where they have been in operation, so that such investigation as may be deemed necessary may be made before approval.

D. Capacities of all equipment and material shall be not less than those indicated.

1. Accuracy. Unless otherwise specified, each individual instrument shall have a minimum accuracy of +-0.5 percent of full scale and a minimum repeatability of +-0.25 percent of full scale.

2. Field Tests: The Contractor shall perform whatever tests as may be requested by the Engineer or as may be needed otherwise to demonstrate compliance with the Contract Documents.

3. Calibration. The Contractor shall provide job site visits and services of a manufacturer's technical field representative for calibration, testing and startup of instrumentation and equipment as needed. All instruments and systems shall be calibrated after installation, in conformance with the component manufacturer's instructions. This shall provide that those components having adjustable features are set carefully for the specific conditions and applications of this installation, and that the components and/or systems are within the specified limits of

accuracy. Defective elements, which cannot achieve proper calibration or accuracy, either individually or within a system, shall be replaced. This calibration work shall be accomplished by the technical field representatives of the System Supplier whom the Contractor shall require to certify in writing that for each loop or system all calibrations have been made and that all instruments are ready to operate.

4. Proof of Conformance: The burden of proof of conformance to specified accuracy and performance is on the Contractor using its designated System Supplier. The Contractor shall supply necessary test equipment and technical personnel if called upon to prove accuracy and/or performance, at no separate additional cost to the Owner, wherever reasonable doubt or evidence of malfunction or poor performance may appear.

E. Nameplates. Each major item of equipment shall have the manufacturer's name, address, serial and model numbers on a plate securely attached to the item.

F. Conformance of agency requirements. Where materials or equipment are specified to be constructed and/or tested in accordance with the standards of the following agencies or organizations, the Contractor shall submit proof of such compliance:

1. The Institute of Electrical and Electronics Engineers (IEEE).

2. The National Electrical Manufacturer's Association (NEMA).

3. The Underwriter's Laboratories, Inc. (UL).

G. All meters, instruments, and other components shall be the most recent field proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise specified to match existing equipment.

H. Analog measurements and control signals shall be electrical as indicated herein, and shall vary in direct linear proportion to the measured variable, except as noted. Electrical signals outside control panel(s) shall be 4 to 20 milliamperes dc except as noted.

I. Environmental. All instrumentation shall be suitable for operation if required, in the ambient conditions at the equipment installation locations. Heating, cooling, and dehumidifying devices shall be incorporated with the outdoor instrumentation in order to maintain it within its rated environmental operating ranges. The Contractor shall furnish and install all power wiring for these devices (e.g., heaters, fans, etc.). NEMA 4 rated enclosures shall be furnished in all general purpose areas, unless otherwise specified. Equipment and systems shall be designed and constructed for satisfactory operation and long, low maintenance service under the following environmental conditions:

1. Control Room: Temperature range: 32 degF through 120 degF. Thermal shock: 1.0% (1.8%F) per minute maximum. Relative humidity: 100 percent maximum

2. Remote Site: Temperature range: 0 degF through 135 degF. Thermal shock: 1.0% (1.8%F) per minute maximum. Relative humidity: 100 percent maximum

J. Protection. Materials and equipment delivered to the site shall be stored and protected in such a manner as to effectively prevent damage from climatic conditions, condensation, dust, physical abuse. A location shall be chosen which will not interfere with the operations of other contractors or the Owner. Storage and handling shall be performed in manners which will afford maximum protection to the equipment and materials. It is the

Contractor's responsibility to assure proper handling and on-site storage of instrumentation and control equipment in accordance with the manufacturers' recommendations.

2.03 COMPLETED SYSTEMS

A. All the systems mentioned shall be complete in every detail except where specifically noted otherwise. Mention of certain materials in these specifications shall not be construed as releasing the Contractor from furnishing such additional materials and performing all labor required to provide a complete and operable system.

2.04 NAMEPLATE AND EQUIPMENT LABELS

A. Provide nameplates constructed of plastic laminated material engraved through black surface material to white sub-layer. Exception: Emergency distribution system component labeling - white letters on red background.

B. Service Entrance Label. Refer to appropriate section.

C. Panelboard Labels. Refer to appropriate section.

D. Receptacle Labels. Refer to appropriate section.

E. Motor Starter and Disconnect Labels. Refer to appropriate sections.

F. Special Equipment Outlet Labels. Refer to appropriate sections.

PART 3 - EXECUTION

3.01 INSTALLATION AND WORKMANSHIP

A. Materials and equipment shall be installed in accordance with the approved recommendations of the manufacturer to conform with the contract documents.

B. The installation shall be accomplished by workmen skilled in this type of work.

3.02 CUTTING OF BUILDING CONSTRUCTION

A. Obtain permission from the Engineer prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills except where space limitations prevent the use of such drills.

B. All construction materials damaged or cut into during the installation of this work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.03 EXCAVATION AND BACKFILLING

A. Provide all necessary excavation and backfilling for installation of underground electrical facilities. Depth per code requirements or as shown.

B. Determine location of all existing underground gas, water, sewer, telephone and electric lines. Locate accurately on ground surface and for depth of same before excavation. Uncover by hand digging. Contractor shall be responsible for any damage or interruptions to these utilities, caused by himself, and other costs incurred by these interruptions.

C. Do not undermine footings or bearing walls.

D. Use power digging equipment only in direction away from existing facilities.

E. Exercise standard safety precautions in excavation near power cables by using insulated handles, rubber gloves and footwear, etc.

F. Do not place backfill until installation to be covered has been tested, inspected and approved.

G. Backfill beneath building slabs, areas to be paved, streets, or sidewalks: 3/4" maximum crushed rock, gravel or sand. Other areas may be backfilled with excavated earth that has all large rocks and foreign matter removed.

H. Backfill in layers not to exceed 6 inches. Compact thoroughly.

I. Dispose of all debris and surplus earth as by the Owner.

3.04 PAINTING

A. Painting in general will be covered under another Division 9 of these specifications, except items furnished under this Division that are scratched or marred in shipment or installation and/or require custom painting.

B. Install equipment with manufacturer's standard finish and color unless otherwise specified. Refinish any marred or oxidized items restored to manufacturer's factory finish.

C. Required surfaces or equipment with no standard finish; clean off grease and scale. Restore to smooth finish. Give one coat of primer, two coats finish.

D. Paint and color as selected by Engineer.

E. All exposed conduits on painted walls shall be painted to match wall and trim colors. Painting to be in accordance with Item (b.) above. Conduit labels shall be neatly affixed and shall not be painted over.

3.05 CLEANUP

A. Contractor shall continually remove debris, cuttings, crates, cartons, etc., created by his work. Such clean up shall be done at sufficient frequency to eliminate hazard to the public, other workmen, the building or the Owner's employees. Before acceptance of the installation, Contractor shall carefully clean cabinets, panels, wiring devices, cover plates, light fixtures, etc., to remove dirt, cuttings, paint, plaster, mortar, concrete, etc. Blemishes to finished surfaces of apparatus shall be removed and new finish equal to the original applied.

3.06 WORKMANSHIP AND INSPECTION

A. Workmanship shall be of the best quality and none but competent electricians shall be employed. All shall be under the supervision of a competent foreman. All completed work shall represent a neat and professional appearance.

B. All work and materials shall be subject to inspection at any and all times by representatives of the Engineer.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical Improvements Complete as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

SECTION 16060 – GROUNDING SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Work consists of providing the complete grounding system shown on the drawings and specified herein. The requirements of all other sections of the specification are equally applicable to the work to be performed under this section.

1.02 GROUNDING SYSTEM

A. This grounding specification is applicable to this and all other sections of the work. Provide all grounding systems and make connections mechanically secure and electrically continuous. Ground all line voltage electrical systems completely and effectively as required by code and as specified herein.

B. Ground all raceway systems and equipment enclosures. Where not otherwise indicated, grounding conductor size shall conform to the most stringent of the governing codes.

1. Ground the service and transformers in an approved manner.

2. Provide grounding where indicated on the drawings.

3. Grounding conductor connections shall be bolted except at inaccessible ground rods, buried ground conductors and reinforcing steel grounding conductor connections, where connections shall be brazed or crimped.

   Exothermic welded connections may be substituted for brazed connections subject to the Engineer's approval and demonstration on the project with actual test connections that the connections will be successfully made.

4. Ground conductors, unless otherwise noted, shall be insulated and shall be run in conduit. In no case shall the grounding conductors be sized smaller than #12 AWG.

5. Continuity of equipment ground shall be maintained throughout the entire raceway, cabinet and equipment enclosure system. Ground bushings and jumpers shall be used wherever normal conduit termination does not insure continuity. Where nonmetallic conduit is used for distribution or where direct burial cables are employed, install a green insulated equipment ground conductor with each circuit.

6. Metal parts of lighting fixtures not otherwise grounded by bolted fastenings shall be bonded to conduit system with green ground wire. Receptacles shall be grounded to outlet boxes with green ground wire and machine screw.

7. Motors and equipment shall be bonded to the equipment grounding system by a continuous green insulated equipment ground conductor run with each circuit through approved flexible conduit connections as permitted by code. Where flexible conduit size exceeds the code approved limits, provide a separate green grounding conductor inside each flexible conduit, bonded to the inside of the connection box and to the nearest accessible supply end conduit junction box.

8. Where concrete pad is provided for utility-furnished transformers, suitable grounding systems shall be provided under this section, including driven ground

rods. Details on the drawings are to establish the general scope of work, but installation shall conform to the serving utility company requirements.

C. Provide ground system as specified here and shown on Drawings.

PART 2 PRODUCTS

2.01 GROUNDING BUSHINGS/WEDGES

A. On all feeders, install a grounding bushing with set screw connector.

2.02 CONNECTORS

A. Cast, set screw or bolted type.

2.03 GROUND RODS

A. Minimum one uncoated 0.50" #4 reinforcing bar tied into foundation reinforcing grid, per 918-305-0160(3)(a) of 2008 Oregon Electrical Specialty code.

2.04 CONNECTONS

A. Ground rod to ground conductor connections, exothermic weld process. Cadweld.

PART 3 EXECUTION

3.01 INSTALLATION

A. Grounding conductor connectors shall be made up tight and located for future servicing and to insure low impedance.

B. The Grounding System shall comply with Article 250 of the N.E.C.

C. All feeder and service raceways shall be grounded.

D. All plug-in receptacles shall have the grounding stud connected to the insulated green equipment grounding conductor shown in all power system conduits.

E. Connect all insulated green ground conductors on a grounding bus in the respective branch circuit panel. Provide a grounding bus in all existing panels which presently are not so equipped.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical Improvements Complete as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

SECTION 16120 – WIRE AND CABLE

PART 1 - GENERAL

1.01 INTRODUCTION

A. All wire and cable for electric circuits shall conform to the latest requirements for the current edition of the NEC and shall meet all ASTM specifications.

B. Any requirements in this section shall be additional.

C. Provide all wire and cable complete.

D. Provide all wire appurtenances.

E. Size as shown on drawings and/or in panel schedule or as required, if not shown otherwise.

F. All wire and cable to be copper.

G. No aluminum conductors are allowed except Electric Utility provided wire or unless specifically called out.

H. Wiring size is generally standard AWG size. Branch circuit cross hatchings shown indicates minimum number of wires, without ground. Minimum size or as noted on plans, or panel schedules.

PART 2 - PRODUCTS

2.01 WIRE

A. Conductors shall be soft-drawn copper with insulation and outer covering as noted. Conductor sizes shall be standard American wire gauge sizes. Conductors No. 8 and larger shall be stranded. All control wiring below 12 gauge shall be stranded.

B. Minimum branch wiring shall be No. 12, 600 volt and shall have color coded phase wires.

C. #16 and lower AWG shall be type TFF or THHN 600 volt stranded.

D. #14 through #10 AWG shall be type THW, THWN, or THHN 600 volt solid conductor.

E. #8 AWG and larger shall be type THHN 600 volt stranded conductor.

F. Conductors installed in underground conduits shall be THW, THWN or THHN as described above.

G. Direct buried feeder and branch circuit cable shall be Type UF or USE as per NEC Article 338 and 339. Buried conductors shall normally be in PVC conduit. Direct buried conductors shall only be permitted upon prior approval by the Engineer.

H. Conductors installed in the wiring channels or in ballast compartments of continuous row fixtures, and in raceway between junction box and recessed fixture to be RHH, 90 deg. C (194 Deg. F) insulation. Do not reduce branch circuit conductor size below circuit protection in wiring channels. Other fixture wiring shall be Type "AF" or "SFF".

I. Wire size, insulation and manufacturer's name shall be clearly and permanently marked on conductor jacket.

J. Wire Color.

1. Wires shall be factory color-coded by integral pigmentation. Colored plastic tape permitted on #6 and larger where integral pigmentation impractical. Apply tape in spiral half-lap over exposed portions in manholes, boxes, panels, switchboards, and other enclosures.

2. Identify second system voltage conductors with different set of colors at all panels, disconnects, junction boxes and/or equipment with 3ø power supply.

Conductor System Voltage	120/240	277/480	120/208
Phase A	Black	Brown	Black
Phase B	Red	Orange	Red
Phase C	Blue	Yellow	Blue
Neutral	White	Grey	White
Equmt Gnd	Green or bare	Green or bare	Green or bare
Travelers	Grey or tan	Grey or tan	Grey or tan

2.02 CABLE

A. Annealed copper in AWG and type as shown on drawings.

B. All conductors shall have color coded pairs.

C. Labels. All cables shall be labeled with a wire marker. The label shall be of the form "CBLXXX" where XXX is a unique number (for example: CBL132, CBL001, CBL567). The markers shall be permanently marked heat-shrink plastic, such as Kroy "Shrink Tube," or equivalent. All markers shall be shrunk to fit the cable with a manufacturer's approved heat shrinking device.

2.03 PULLING LUBRICANTS

A. UL approved soap type only.

2.04 WIRE MARKERS

A. Pre-marked, heatshrink type. All wires shall be marked. Each conductor shall be designated by a single unique wire number which shall be shown on all drawings. These numbers shall be displayed on all conductors at every terminal or termination using preprinted white wire markers with black numbers. The markers shall be permanently marked heat-shrink plastic, such as Kroy "Shrink Tube," or equivalent. All markers shall be shrunk to fit the wire with a manufacturer's approved heat shrinking device.

2.05 PULL WIRES

A. Dry Location. #12 TW Copper.

B. Damp Locations, Under Slab, or Below Grade. #12 TW Copper.

2.06 WIRE CONNECTION AND APPURTENANCES

A. Wire connections shall be made with pressure-type solderless connectors.

B. Connections Between Aluminum and Copper. No aluminum is allowed.

C. Oxide Inhibiting Compound. Alnox "UG", Idean "NOALOX", Penetrox "A".

D. Inline Splicing Kits. 3M brand "Quick Splice", 5400 series.

E. Waterproof Splicing. 3M Scotchcast.

PART 3 - EXECUTION AND WORKMANSHIP

3.01 DELIVERY, STORAGE AND HANDLING

A. Deliver to site in new standard coils or reels with approved tag denoting length, wire size, insulation type and manufacturer's name.

B. Suitably protect from dirt, weather, and damage during storage and handling.

3.02 WIRE PULLING

A. Do not pull wire until all work of any nature is completed which might damage insulation or fill conduit with foreign material. Conduits shall be clean and dry before pulling wire.

B. Do not use mechanical means to pull #8 or smaller wires.

C. Exercise care in avoiding injury to wire or insulation during pulling.

D. Identify all wires or circuits with wire markers after pulling. For all control wiring and telemetering systems, wire markers in junction boxes and at solenoids shall bear same numbers as terminal blocks. Keep accurate up-to-date as-built records.

3.03 CIRCUITING

A. Conduit may be routed at Contractor's best judgment unless directed otherwise. Home runs are diagrammatic for clarity, and may be grouped as desired. Size conduits accordingly with capacity for 25% fill. See Raceways this Division. All branch circuitry conduit shall have NEC sized ground provided.

B. Any deviation in circuiting that is approved by the Engineer shall be recorded on as-builts and panel schedules in specifications.

3.04 SPLICING

A. No splices or taps permitted in service or feeder circuits. Splices or taps in branch circuits permitted only in junction boxes where circuits divide.

B. Splices to fixtures and equipment shall have a 6-inch minimum pigtail.

3.05 PULL WIRES

A. Provide pull wires in all empty conduits for future use. Identify both ends with labels or tags reading "PULL WIRE" with a number for reference.

3.06 WIRE CONNECTION AND SPLICING

A. Manufacturer's Instructions. Install connectors in strict accordance with manufacturer's instructions for specific conductor size, voltage and type of connection required.

B. Insulation. Cover splices, joints and free ends of conductors with insulation equivalent to that of conductor, using insulating rubber tape and friction tape or plastic tape.

C. Continuity. Where conductors are connected to metallic surfaces, remove any coating and polish surface. Remove lacquer coating of conduits where ground clamps are to be installed.

D. Waterproof Splices. Waterproof splices and connections to fixtures and equipment as designated on drawings shall be Scotchcast, 3M or approved. Leave 18" pigtail for future splices.

E. It is the responsibility of the electrical contractor to utilize proper protective tape as deemed by the equipment or motor and equipment temperature conditions, for a quality craftsmanship type job.

F. No splices are allowed in control cables, telemetering or telephone cables above or below the ground unless in a junction box or control panel without permission from the Engineer.

3.07 ENCLOSURE SIGNAL AND CONTROL CIRCUIT WIRING

A. Wiring installation: All wires shall be run in plastic wireways except (1) field wiring, (2) wiring run between mating blocks in adjacent sections, (3) wiring run from components on a swing-out panel to components on a part of the fixed structure, and (4) wiring run to panel-mounted components. Wiring run from components on a swing-out or front panel to other components on a fixed panel shall be made up in tied bundles. These bundles shall be tied with nylon wire ties, and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals. Signal and low voltage wiring shall be run separately from power and 120 V control wiring.

B. Wiring run to control devices on the front panels shall be tied together at short intervals with nylon wire ties and secured to the inside face of the panel using adhesive mounts.

C. Wiring to rear terminals on panel-mount instruments shall be run in plastic wireways secured to horizontal brackets run above or below the instruments in about the same plane as the rear of the instruments.

D. Conformance to the above wiring installation requirements shall be reflected by details shown on the shop drawings for the Engineer's review.

E. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal using white numbered wire markers which shall be permanently marked heat-shrink plastic as described above.

3.08 ELECTRICAL TESTS

A. Electrical insulation resistance tests for each of the following items shall be performed with respect to ground and adjacent cables.

1. All new switchboards, control wiring circuits, motor wiring circuits, panel boards and sub-distribution feeders from switchboards to panel boards.

2. Perform continuity test to insure proper connection.

3. Insulation resistance tests shall be performed at 1,000 volts D.C. for one-half minute.

4. Insulation resistance shall in no case be less than following table.

MINIMUM INSULATION RESISTANCE	
Conductor of Circuit Size	Minimum Resistance
No. 14 and 12 AWG	1,000,000 ohms
25 - 50 ampere	250,000 ohms
51 - 100 ampere	100,000 ohms
101 - 200 ampere	50,000 ohms
210 - 400 ampere	25,000 ohms
401 - 800 ampere	12,000 ohms
Over 800 ampere	5,000 ohms

5. These values are determined with all switchboards, panelboards, fuse holder, switches and overcurrent devices in place.

6. Test results shall be documented in an organized typewritten manner documented as "Insulation Resistance Test Report" and submitted to the Engineer in triplicate prior to acceptance.

7. Tests shall be done in the presence of the Engineer or his representative. Seventy-two (72) hour notice shall be given prior to testing.

8. Any circuit not meeting test requirements shall be replaced and retested until it meets test requirements.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical Improvements Complete as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

SECTION 16130– RACEWAY AND BOXES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide raceway system complete. All sizes shown on the diagrams shall be considered minimums. All sizes and lengths provided in the conduit or wiring schedules shall be considered minimums and estimates. Contractor shall be responsible for selecting sizes that will properly accommodate all wires and cables. Contractor should assume that not all conduits are shown on the diagrams or in the schedules.

B. All project wiring, including cables, shall be in conduit unless otherwise noted herein or on drawings.

C. Sizes as shown on drawings or as required, if not shown on drawings. Conduit shall be filled no more than 25%. Provide pull wires in all empty conduits for future use. Identify both ends with labels or tags reading "PULL WIRE" with a number for reference.

D. Chases, openings, sleeves, hangers, anchors, recesses, equipment, pads of framing for fixtures provided under other divisions only if specified or shown. Otherwise, provided under this Division. In any event, this Division shall be responsible for correct size and location.

E. Codes and Standards. NEC shall govern use and installation of conduit types. Standards for conduits shall be as defined by ANSI, Federal and UL specifications. Standards for nonmetallic per NEMA TC-2. Any requirements of this section shall be additional.

F. Labels. Any raceway which is not wholly contained in one room and whose full length is not clearly visible shall be labeled at each end, junction, size change, or any other place where a label would clarify its identity. The label shall be of the form "CXXX" where XXX is a unique number (for example: C132, C081, C567). A unique number shall be used for each raceway and shall be displayed and noted on the Record Drawings. The labeling means shall be a machine printed nylon wrap-around wire-tie style tag made for the purpose of labeling pipe or conduit. Other means of labeling may be submitted to the Engineer for approval. Hand-written indelible ink labels are not acceptable.

G. The electrical contractor shall furnish and install all plant raceways, including instrumentation and signal raceways. Contractor is responsible for furnishing and installing all circuits and raceways necessary for a complete, working system, whether or not they are shown or described in the contract documents. The Division 16 Electrical plans do not show all conduits and those that are shown are shown schematically (not necessarily in their correct, installed, positions). Contractor should verify all conduits' location and size by actual manufacturers' data. Contractor shall coordinate with other division contractors to make sure that raceways shall be installed in the proper places and shall be the proper sizes and materials. Electrical Contractor shall also connect all power conductors to 120V/240V/480V plant devices, including instrumentation meters and recording devices furnished under other divisions. Electrical Contractor shall connect all analog 4-20mA current loop signal circuits.

H. Consult the contract drawings for additional information, including the use of stainless steel raceway in many locations. Special study should be given to the manufacturers' equipment plans to assure that appropriate conduits and conductors are installed so that all components are properly connected.

PART 2 - PRODUCTS

2.01 RIGID GALVANIZED STEEL CONDUIT (RGS)

A. Hot dipped galvanized. Required in all concrete or block work unless otherwise specified. Required for all stub-ups. Required for all transitions from underground PVC when passing through concrete.

B. Rigid fittings to be galvanized malleable iron or noncorrosive alloy compatible with galvanized conduit. Erickson couplings, watertight split couplings (OZ or equivalent) permitted.

2.02 ELECTRICAL METALLIC TUBING (EMT).

A. Hot dip galvanized, electrogalvanized or sherardized, steel tubing. Permitted only in specified areas.

B. Couplings and Connectors. Raintight; steel or malleable iron type using a split corrugated compression ring and tightening nut or stainless steel locking disc. Indenter or set screw fittings shall only be acceptable in office and laboratory rooms.

2.03 PVC CONDUIT.

A. Schedule 40 rigid polyvinyl chloride type with ground wire. Generally required for all underground installations. Not permitted in any concrete or block work. Not permitted for stub-ups, even in protected areas (except power pole risers). Not permitted in attics.

B. Pre-formed PVC elbows and fittings unless otherwise noted on drawings.

2.04 RIGID ALUMINUM CONDUIT.

A. Permitted only in specified areas.

B. Fittings to be copper free cast aluminum.

2.05 FLEXIBLE PVC CONDUIT, WET LOCATIONS AND DRY LOCATIONS.

A. Liquid Tight, PVC weatherproof for damp and wet locations.

B. Fittings Thomas and Betts or approved.

2.06 SURFACE METAL RACEWAY.

A. Formed steel type, standard factory painted finish. Where choice of colors is available, consult Engineer for color selection.

B. All hinged type raceways to have piano type hinges.

C. Surface metal raceways only allowed where specifically called out on drawings, or unless prior approval by Engineer.

2.07 RIGID STAINLESS STEEL CONDUIT (SS)

A. Solid stainless steel. Required in most outdoor environments or as specified.

B. Fittings to be threaded stainless steel. Stainless steel Erickson couplings, watertight split couplings (OZ or equivalent) permitted so long as all components are of the same stainless steel alloy and are water proof.

PART 3 - EXECUTION

3.01 CONCEALED WORK

A. In general, install raceways concealed in construction except where shown otherwise on the Drawings or unless specifically approved by Engineer.

3.02 CLEAN & DRY

A. Install conduit dry and free of debris using approved plugs or caps. Cap and securely support conduits prior to concrete pour.

3.03 ROUTING

A. Conduit in general may be routed at Contractor's best judgment unless directed otherwise. All conduits in or under concrete floors shall be recorded on as-builts as distances from walls in feet or inches. Home runs are diagrammatic for clarity and may be grouped as desired.

3.04 RIGID GALVANIZED STEEL CONDUIT (RGS)

A. All connections shall be watertight. Install RGS for all raceways in concrete or where subject to damage. Running thread or set screw type fittings not approved.

B. Conduit in Slab.

1. Minimum 3" concrete cover. Space not less than 8" on center and as wide as possible where converging at panel, etc.

2. Do not interfere with placement of reinforcing steel. Place conduit between upper and lower layers.

C. Expansion Joints. Install offset or sliding type where embedded conduits cross building expansion joints. Sliding type to have bonding strap and clamp.

D. Floor Stub-Ups - Accessible Floor Areas. Install rigid conduit with threaded coupling set flush with finished floor. Seal with flush, threaded pipe plug.

E. Raceways that stub-up above floor: Install at such depth that the exposed raceway is vertical and no curved section of the elbow is visible.

F. Rigid steel installed in earth including bends to be coated entire length with coal-tar material. Koppers Bitumastic 515 or with 15 mil. PVC Jacket. (Repair abrasions with PVC base paint or PVC). This is not a preferred method; where possible, use PVC conduit underground.

3.05 RIGID ALUMINUM CONDUIT.

A. Do not install aluminum conduit in earth, cinders or concrete.

B. May be used in lieu of steel where conduit is run in attics or above suspended ceilings where not subject to physical damage.

C. Not allowed where attached to concrete or masonry. Not allowed where other adjacent metals might electrolytically react with the aluminum.

3.06 ELECTRICAL METALLIC TUBING (EMT).

A. Install for wiring in frame construction and for wiring in furred ceilings and above suspended ceilings. May be used for exposed work in unfinished areas where not subject to damage, but only upon prior approval by the Engineer.

3.07 PVC RACEWAYS.

A. Use of PVC outside of building 5' and beyond. See Plans for Special Applications.

B. All bends shall be manufactured. Site-made heat bends may be approved by the Engineer on a case by case basis.

3.08 FLEXIBLE CONDUIT.

A. Provide flexible raceway connection to motors and equipment subject to vibration with 90 degrees loop minimum to allow for isolation. Use liquid tight. Provide bonding jumper when required by code.

3.09 SURFACE METAL RACEWAYS.

A. Install parallel to a building surface (i.e., wall, ceiling, floor). Fasten to surface as recommended by manufacturer. Mount so raceway is in the least visible location. Allowed only upon prior approval by Engineer.

3.10 UNDERGROUND CONDUIT.

A. Install with minimum cover of 36" over PVC and 30" over (RGS) finished grade.

B. Install underground marking tape. Bury 6-8 inches below grade, directly above conduit.

C. Install with 3" per 100' downward slope from buildings or section high points toward junction boxes, which are to be provided with drainage facilities.

D. Cap off watertight all conduits stubbed out for future use. Place #12 TW pull wire with tag at both ends.

E. Call for inspection prior to backfilling of any trenches, concrete pours containing conduits, and/or covering of conduits. Give a minimum of 48 hours notice prior to cover up.

F. Keep an accurate up-to-date location record of all underground and under floor conduits with dimensions from wall lines parallel and perpendicular.

G. Underground Marking Tape for all Underground Electrical and Telephone. 6" wide, yellow, low density polyethylene, 4-mil thickness. Imprinted with "CAUTION - STOP DIGGING - BURIED ELECTRIC LINE BELOW" and current date. Somerset "Protect-A-Line". Tape for telephone, network and signal line similar except green. All underground wiring and cabling shall be in conduit.

3.11 RACEWAY BENDS.

A. Conduit Bending. Bends in 1" size and larger shall be factory ells or made with manufactured mechanical bender. All entry ells shall be long radius type.

3.12 BUSHINGS

A. Factory insulated.

B. All panels, junction boxes and metal raceways shall have bushings when entered or exited by a conduit of any type.

3.13 RACEWAY SUPPORT DEVICES.

A. All hardware such as inserts, straps, bolts, nuts, screws and washers shall be galvanized or stainless steel. No cadmium plated steel shall be allowed.

B. Trapeze Hangers, Channel. 1-1/2" x 1-1/2" galvanized or stainless, 12 gauge. Kindorf.

C. Rods. Minimum 3/8" diameter.

D. Beam Clamps. Hardened point set screws. Compatible with structural members.

E. Pipe Strap. Approved type. Perforated plumbers tape not acceptable.

3.14 RACEWAY SUPPORT AND INSTALLATION.

A. Support conduits at intervals not greater than 10' and within 3' of any fitting, outlet or junction box, or cabinet, or as required by the NEC.

B. Secure single runs with pipe strap.

C. Hollow Masonry. Galvanized or stainless toggle bolts.

D. Concrete, Solid Masonry. Expansion shields and galvanized or stainless machine screws or standard preset inserts.

E. Metal Surfaces. Galvanized or stainless machine screws or bolts.

F. Wood Construction. Galvanized or stainless wood screws, or galvanized J-Nail.

G. Suspended from Ceiling. Pipe hanger and rod.

H. Damp Locations. Install clamp backs under each clamp on exposed surface conduits to prevent moisture accumulation.

I. Support multiple runs with trapeze hangers where conduits run exposed and parallel. Attach to structure with hanger rod as follows:

1. Steel Members. Galvanized or stainless beam clamps.

2. Concrete. Concrete inserts set flush with surface, insert reinforcing rod through insert opening where provided.

3. Wood Framing. Ceiling hanger flange, galvanized or stainless wood screws.

J. When more than two conduits would use the same routing, group together on a patented channel support system (such as Unistrut).

K. Damp Locations. Install clamp backs under each clamp on exposed surface conduits to prevent moisture accumulation.

L. Run all exposed conduits parallel and plumb to structure lines. In building interior locations, conduits shall be concealed in walls or ceilings wherever possible and exposed work shall run parallel to building lines. Conduits shall not be routed on floors in areas subject to foot traffic. In exterior locations conduit shall be routed below grade. Where concrete or asphalt slabs exist they shall be saw cut, conduits installed, and the cut repaired to original condition. Exposed conduits and/or raceway shall be installed perpendicular or parallel to building lines.

M. Maintain 6" minimum separation from hot water lines. Do not run conduit beneath boilers or heating units.

3.15 SEALING OF RACEWAY PENETRATION.

A. Exterior Wall Surfaces Above Grade. Seal around all penetrations with caulking approved by Engineer. For concrete construction above ground level, cast raceway in wall or core drill wall and hard pack with a mixture of equal parts of sand and cement.

B. Exterior Surfaces Below Grade. Cast raceway into wall (or floor) or use manufactured seal assembly (such as OZ type "FSK") cast in place.

C. Roofs. Provide mopped, lead, roof jack where raceway penetrates roof membrane.

3.16 SEALING OF RACEWAYS.

A. All conduits to and from hypochlorite generation room shall be sealed on both ends. Pack tightly around conductors in raceway. This includes all light fixture boxes, receptacle boxes, heater junction boxes and chlorinator junction boxes.

B. Both ends of conduits to and from reservoir control boxes shall be sealed on both ends.

C. Seal interior of all raceways which pass through building roof or through outside walls of the building, above or below grade. Seal on the end inside the building, using duct sealing mastic, non-hardening compound type, specially designed for such service. Pack around the wires in the raceways.

D. For exterior wall penetrations below grade, install OZ type "CBS" sealing bushing at interior end of penetrating raceway. Threaded fittings only are permitted in entering raceways ahead of the sealing bushing.

E. Appropriate sealing devices such as "EYS" series fittings shall be used where hazardous locations exist as classified by NEC.

3.17 CLEANUP.

A. At time of final cleanup, thoroughly clean all raceways of any debris. This includes wire ends and pieces of insulation.

3.18 PAINTING.

A. All exposed conduits on painted walls to be painted to match wall and trim colors.

B. See Basic Methods this Division.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical Improvements Complete as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

16131 - OUTLET AND PULL BOXES

PART 1 - GENERAL

1.01 PROVIDE AS NEEDED OR SHOWN ON DRAWINGS

A. Provide outlet and pull boxes as required to enclose devices, permit pulling conductors and for wire splices and branches.

B. Provide all outlet and pull box appurtenances.

PART 2 - PRODUCT DESCRIPTION

2.01 OUTLET AND PULL BOX SIZES

A. Flush wall switch or receptacle to be 4 inch square, 1-1/2 inches or more deep, with single or two gang plaster ring mounted vertically except where noted to be mounted horizontally such as possibly counter back splashes. Where three or more devices are at one location, use one piece multiple gang box, with suitable plaster ring. Install not more than one device per gang unless otherwise noted on the plans.

B. Wall bracket and ceiling surface mounted lighting fixture outlet to be 4 inch octagon, 1-1/2 inches deep with 3/8 inch fixture stud where required. Wall bracket outlet to have single gang plaster ring.

C. Surface outlets where exposed conduit is allowed, to be same as flush outlet boxes without plaster ring but with cadmium or galvanized device plate.

D. Junction boxes for branch circuits to be not less than 4 inch square, 1-1/2 inches or more deep. Boxes with 1 inch conduit terminating in same, to be 4-11/16 inches square.

E. Liquid tight outlet and junction boxes to be 4 inches square, 1-1/2 inches or more deep and be fitted with neoprene gaskets. Outlet and junction boxes in filter room shall all be liquid tight.

F. Liquid tight PVC junction boxes shall be "Carlon" high impact gasketed PVC molded box with screwdown cover and stainless steel screws. Catalog No. E989R or equivalent. Exterior junction boxes may be PVC or galvanized as directed by Engineer.

G. Exterior exposed and equipment mounted junction boxes shall be cast galvanized, gasketed and painted to match equipment or left galvanized as directed by Engineer. Exterior junction boxes may be PVC or galvanized as directed by Engineer.

2.02 GREATER THAN 150 VOLTS

A. Device boxes containing multiple devices for system rated over 150 volts to ground are permitted only with steel barrier manufactured especially for the purpose of dividing the box into separate compartments for each device having exposed live parts.

2.03 IN CEILINGS

A. Junction or pull boxes in suspended ceilings shall be supported from structure independently from ceiling suspension system.

2.04 OUTLET BOX GROUNDING

A. All flush outlet boxes serving receptacles (12-V or more) shall be equipped with a green grounding screw.

2.05 DEVICE BOXES CONTAINING EMERGENCY AND NORMAL DEVICES.

A. Permitted only with steel barrier manufactured especially for the purpose of dividing the box into two completely separate compartments.

2.06 DEVICE BOXES CONTAINING POWER AND TELEPHONE OR TELEMETERING.

A. Permitted only with steel barrier manufactured especially for the purpose of dividing the box into two completely separate compartments.

PART 3 - INSTALLATION AND WORKMANSHIP

3.01 PLUMB, SQUARE

A. All boxes to be fastened securely in place at the proper depth plumb with equipment, walls and fixtures for proper installation of switches, outlets and covers.

3.02 HARDWARE

A. All conduits shall be secure and attached to boxes with proper hardware.

3.03 REMOUNT

A. All boxes not meeting the above requirements shall be removed and remounted as directed by the Engineer or his representative.

3.04 FLUSH WITH WALL

A. Except for surface mounted boxes or boxes above accessible ceilings, all boxes shall have flush edge (box or plaster ring) even with the finished surface of the wall or ceiling.

3.05 ELECTRICAL WORK IN COUNTERBACKS, MILLWORK AND CASEWORK

A. Provide as shown and/or specified. Provide templates, where required, to other trades for drilling and cutting to insure accurate location of electrical fixtures (outlets and devices). Provide all wiring, devices, plates and connections as required by said fixtures.

3.06 CONNECTION TO EQUIPMENT

A. Furnished under this or other Divisions of the specifications, or by others. Provide outlet boxes of sizes and at locations necessary to serve such equipment. Outlet box required if equipment has pigtail wires for external connection, does not have space to accommodate circuits wiring or requires a wire different from circuit wiring used. Study equipment details to assure proper coordination.

3.07 BLANK COVERS

A. Provide blank covers or plate over all boxes that do no contain devices or are not covered by equipment.

B. No blank outlet and pull boxes will be allowed in finished walls or ceilings without permission from the Engineer.

3.08 LIGHTING FIXTURE BOXES

A. In ceilings of acoustical material. Locate in accordance with approved ceiling layout plans and so that fixtures replace full size ceiling tiles wherever possible.

3.09 ELECTRICAL OUTLETS

A. Coordinate the work of this Section with the work of other sections and trades. Study all drawings that form a part of this contract and confer with the various trades involved to eliminate conflicts between the work of this Section and the work of other trades. Check and verify outlet locations indicated on Architectural drawings, door swings, installation details and layouts of suspended ceilings and locations of all plumbing, heating and ventilating equipment.

B. Centered on Built-in Work. In the case of doors, cabinets, recessed or similar features, or where outlets are centered between two such features, such as between a door jamb and a cabinet, make these outlet locations exact. Relocate any outlets which are located off center.

C. Vertical and Horizontal Relationships. Where more than one outlet is shown or specified to be at the same elevation or one above the other, align them exactly on centerlines horizontally or vertically. Relocate as directed all such outlets (including lighting, receptacle, power, signal and thermostat outlets) which are not so installed, at no additional cost to Owner.

D. Device Outlet Height. Measure from the finished floor to the centerline, unless otherwise noted.

E. Switches: 4 feet, set vertically

F. Receptacles:12 inches, set vertically or as indicated

G. Other: As shown on the plans or as directed by Engineer

H. Ceiling Location. For acoustical material locate outlet either at the corner joint or in the center of a panel, whichever is closer to the normal spacing. Locate all outlets in the same room in same panel position.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical Improvements Complete as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

SECTION 16140– WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Work consists of providing and installing switches, receptacles, and other devices shown on the drawings and specified herein.

B. Furnish and install wiring devices of number, rating and type shown on drawings or called out in these specifications.

C. Devices to include appropriate outlet box, cover, wall plate and other necessary installation materials for a complete and satisfactory operation system.

D. In general, all devices shall be by one manufacturer unless specifically called out otherwise in these specifications or on drawings.

PART 2 - PRODUCTS

2.01 APPROVED DEVICES

A. Manufacturer's with equivalent devices meeting specifications. Bryant, Hubbell, Arrowhart and Leviton. Numbers have been listed as to style, grade and as a guide.

1. Wall Switches. Heavy duty AC quiet type, Federal Specification W.S. 896 (de).

   a. Single Pole. Hubbell; 20 amp, 120/277 VAC.

   b. 3 Way. Hubbell; 20 amp, 120/277 VAC.

   c. 4 Way. Hubbell; 20 amp, 120/277AC.

2. Receptacles. Heavy duty AC, Federal Specification WC-596a.

   a. Single. Hubbell; 20 amp, 125VAC.

   b. Duplex. Hubbell; 20 amp, 125VAC.

3. Combination Devices.

   a. Combination Switch and Receptacle. Hubbell; 20 amp 125VAC receptacle and switch.

   b. Two Single Pole Switches. Hubbell; 20 amp, 120/277VAC.

4. Groundfault Interrupter Receptacle.

   a. Duplex Receptacle, Hubbell 20 amp, 125VAC, GF15 Series.

5. Cover Plates.

a. Nonconductive smooth plastic. All switches and dimmers to be gauged and covered by one plate. All wall plates to be standard size and meeting Federal specification WW-455A noncombustible, supplied with metal mounting screws matching color of plate. Hubbell NP Series - match existing. All switches and devices shall be ganged wherever possible.

b. Engraved Device Wall Plates. Unless shown otherwise, provide engraved plates for panels and devices. Letter height shall be 3/16" (minimum), color of filling to be white or black, as appropriate for contast. Before ordering, submit a sample of the above wall plate with engraving. A name plate schedule will be supplied by Engineer at the time of submittal.

c. Weather Resistant (WP) Cover Plates. Hubbell; self-closing HBL5221, provide appropriate gasket to box.

d. Telephone and TV Cover Plates. Hubbell; NP737 - 5/8" hole.

e. Cover plates in unfinished areas and where exposed conduit is used.

i. Raised galvanized to be used in unfinished areas or where conduits run exposed. Labeling of switch shall be by Melamine Plate attached to cover plate. Verify areas with Engineer prior to installation of cover plates.

2.02 PLUG MOLD

A. Provide plug mold for surface mounting as shown on drawings, with proper number of receptacles as shown. All plug molds to be grounded. Submit plug mold with wiring devices.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Devices and finish plates shall be installed plumb with building lines.

B. Finish plates and devices shall not be installed until final painting is complete. Scratched or splattered finish plates and devices will not be accepted.

C. Wall mounted receptacles shall be installed vertical 48" above floor, or as shown.

D. Receptacles shall be checked for line to neutral, line to ground and neutral to ground integrity.

E. Install GFI receptacle circuits at all locations.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical Improvements Complete as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

SECTION 16210 – POWER UTILITY SERVICE

PART 1 - GENERAL

1.01 UTILITY COMPANY

A. See electrical one-line diagrams and electrical site diagrams for additional information.

B. Three phase transformer services will be pole mounted by utility

C. Utility Company Fees, shall be included as part of the contract. The Utility is Pacific Power Corporation and will provide wire, transformers, and the pull box. Contractor is responsible for installation of meter base, pull box, and conduit. Contractor shall transfer utility service over to the City account at end of contract period.

1.02 RELATED SECTIONS

A. Section 16010 - Electrical Introduction

1.03 WORK INCLUDED

A. The Division 16 contractor shall furnish and install all service equipment, raceway, transformers, etc., as shall be required by the power utility company to make a complete, operable power system, as further described in the contract documents.

B. Contractor shall pay all fees, connect charges, permits, etc., as may be required to provide service to the project (but see above).

C. Contractor shall be responsible for ordering service changes and coordinating all service related work with the General Contractor and the operator so as to provide uninterrupted plant processes and smooth transitions from old services to new.

D. Contractor shall be responsible for planning, ordering and paying for all temporary power services as may be needed during construction.

END OF SECTION

DIVISION 16230 – STANDBY GENERATOR

PART 1 - GENERAL

1.01 SCOPE

A. The standby power generator shall be a 4-cycle direct injection, diesel fueled, engine generator set with weatherproof enclosure as a single skid, sized as specified herein. Genset minimum ratings: 50 kW, 63 kVA at 0.80 PF rating, based on site conditions noted below. System voltage of: 480 Volts AC, three phase, four-wire, 60 hertz.

B. The engine generator set shall be capable of producing the rated kW and kVA when operating at 100 feet altitude and an ambient temperature up to 40° C (104° F). The manufacturer shall provide data to verify the set will operate as required in the specified ambient conditions.

C. Provide complete factory built generator set equipment with digital (microprocessor-based) electronic generator set controls, digital governor, and digital voltage regulator.

D. Provide factory test, startup by a supplier authorized by the equipment manufacturer(s), and on-site testing of the system.

E. The generator set manufacturer shall warrant all equipment provided under this section so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

F. Genset shall include a weatherproof enclosure suitable for an outdoor environment.

1.02 CODES AND STANDARDS

A. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of these standards.

1. CSA 282, 1989 Emergency Electrical Power Supply for Buildings

2. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

3. NFPA37 – Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

4. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

5. NFPA99 – Essential Electrical Systems for Health Care Facilities

6. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.

B. The generator set and supplied accessories shall meet the requirements of the following standards:

1. NEMA MG1-1998 part 32. Alternator shall comply with the requirements of this standard.

2. UL1236 – Battery Chargers

3. UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed.

C. The control system for the generator set shall comply with the following requirements.

1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.

2. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.

3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.

4. FCC Part 15, Subpart B.

5. IEC8528 part 4. Control Systems for Generator Sets

6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.

7. UL508. The entire control system of the generator set shall be UL508 listed and labeled.

8. UL1236 – Battery Chargers.

D. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.03 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include Cummins, Kohler, and Caterpillar. Other manufacturers capable of producing equipment equal to or greater in quality than that described herein shall be pre-approved by the Engineer.

1.04 SUBMITTALS

A. The generator proposed for this project must be preapproved through the pre-bid submittal process as outlined in Section 01300.

B. Submittal shall include: prototype test certification showing all standard and optional accessories to be furnished, schematic wiring diagrams, dimensional drawings, installation instructions, interconnection diagrams identified by terminal number, and each required interconnection between the generator set, and the transfer switch.

PART 2 - PRODUCTS

2.01 GENERATOR SET

A. Ratings

1. The generator set shall operate at 1800 rpm and at a voltage of: 480 Volts AC, three phase, 60 hertz.

2. The generator set shall be rated at minimum 50 kW, 63 kVA at 0.8 PF, standby rating, based on site conditions of: Altitude 1,200 ft, ambient temperatures up to 40° C (104° F).

3. The generator set rating shall be based on standby service.

B. Performance

1. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load for both parallel and non-parallel applications. 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 0.25%.

3. The engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.

4. Motor starting capability shall be a minimum of 221 kVA. The generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified kVA load at near zero power factor applied to the generator set.

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. Telephone influence factor shall be less than 40.

C. 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, and the enclosure door shall be gasketed. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.

D. 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 common, permanently labeled terminal block assembly.

2.02 ENGINE AND ENGINE EQUIPMENT

A. The engine shall be diesel fueled, radiator and fan cooled. The horsepower rating of the engine at it's minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Engine accessories and features shall include:

B. Complete engine fuel system, including all pressure regulators, strainers, and control valves. The fuel system shall be plumbed to the generator set skid for ease of site connections to the generator set.

1. The generator set engine shall be diesel fired.

C. 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, and operating in various isochronous or parallel states.

D. Skid-mounted radiator and cooling system rated for full load operation in 104 degrees F (40 degrees C) ambient as measured at the generator air inlet, based on 0.5 in H2O external static head. 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. Rotating parts shall be guarded against accidental contact.

E. Electric starter(s) capable of three complete cranking cycles without overheating.

F. Positive displacement, mechanical, full pressure, lubrication oil pump.

G. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.

H. Replaceable dry element air cleaner with restriction indicator.

I. Engine mounted battery charging alternator, 40-ampere minimum, and solid-state voltage regulator.

J. Coolant heater

1. 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.

2. The coolant heater shall be installed on the engine with high temperature 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 be installed using quick disconnect couplers

to isolate the heater for replacement of the heater element. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.

3. The coolant heater shall be provided with a 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.

4. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 100F (40C) in a 40F ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.

K. Provide vibration isolators, spring/pad type or as recommended by the manufacturer, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.

L. Starting and Control Batteries shall be calcium/lead antimony type, sized as recommended by the engine manufacturer, complete with battery cables and connectors.

M. Provide exhaust silencer(s) for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards.

N. BATTERY CHARGER – Provide a minimum 10 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.

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.

2.03 AC GENERATOR

A. 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. Actual temperature rise measured by resistance method at full load shall not exceed 105° C.

B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.

D. The subtransient reactance of the alternator shall not exceed 15 percent, based on the standby rating of the generator set.

E. The alternator shall be configured with 12-lead, upper broad range wiring.

2.04 GENERATOR SET CONTROL

A. 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.

B. 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.

C. The generator set mounted control shall include the following features and functions:

1. Control Switches

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.

2. Generator Set AC Output Metering. 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. 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.

3. Generator Set Alarm and Status Display

a. 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:

i. 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).
ii. 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.
iii. The control shall include a flashing red lamp to indicate that the control is not in automatic state, and red common shutdown lamp.
iv. The control shall include an amber common warning indication lamp.

b. 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:

low oil pressure (warning)
low oil pressure (shutdown)
oil pressure sender failure (warning)
low coolant temperature (warning)
high coolant temperature (warning)
high coolant temperature (shutdown)
high oil temperature (warning)
engine temperature sender failure (warning)
low coolant level (warning)
fail to crank (shutdown)
fail to start/overcrank (shutdown)
overspeed (shutdown)
low DC voltage (warning)
high DC voltage (warning)
weak battery (warning)
low fuel-daytank (warning)
high AC voltage (shutdown)
low AC voltage (shutdown)
under frequency (shutdown)
over current (warning)
over current (shutdown)
short circuit (shutdown)
over load (warning)
emergency stop (shutdown)
(4) configurable conditions

c. 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.

4. Engine Status Monitoring

a. The following information shall be available from a digital status panel on the generator set control:

engine oil pressure (psi or kPA)
engine coolant temperature (degrees F or C)
engine oil temperature (degrees F or C)
engine speed (rpm)
number of hours of operation (hours)
number of start attempts
battery voltage (DC volts)

b. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.

D. 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.

E. 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. Controls shall be provided to monitor 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 controls 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. The protection for this function shall be 3rd party certified to very performance.

3. Controls shall be provided to individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445. The protection for this function shall be 3rd party certified to very performance.

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. An line to neutral sensing 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.

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.

F. Other Control Functions

1. The generator set shall be provided with a network communication module to allow LonMark compliant communication with the generator set control by remote devices. The control shall communicate all engine and alternator data, and allow

starting and stopping of the generator set via the network in both test and emergency modes.

2. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage are outside preset limits. During engine cranking (starter engaged), the low voltage limit shall be disabled, and DC voltage shall be monitored as load is applied to the battery, to detect impending battery failure or deteriorated battery condition.

G. 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.

4. The control shall be provided with a direct serial communication link for the LonWorks communication network interface as described elsewhere in this specification and shown on the drawings.

2.05 OTHER EQUIPMENT TO BE PROVIDED WITH THE GENERATOR SET

A. The generator set shall be provided with a mounted main line circuit breaker, sized to carry the rated output current of the generator set. The circuit breaker shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided.

B. Outdoor Weather-Protective Enclosure

1. The generator set shall be provided with an outdoor enclosure, with the entire package 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.

2. 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:

   Primer thickness, 0.5-2.0 mils. Top coat thickness, 0.8-1.2 mils.

   Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.

   Crosshatch adhesion, per ASTM D3359-93, 4B-5B.

   Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.

   Salt Spray, per ASTM B117-90, 1000+ hours.

   Humidity, per ASTM D2247-92, 1000+ hours.

   Water Soak, per ASTM D2247-92, 1000+ hours.

3. 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.

4. Enclosure shall be constructed of minimum 3.2mm aluminum panels. All hardware and hinges shall be stainless steel.

5. A factory-mounted exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.

6. The enclosure shall include the following maintenance provisions:

   a. Flexible coolant and lubricating oil drain lines that extend to the exterior of the enclosure with internal drain valves;

   b. External radiator fill provision.

PART 3 - OPERATION

3.01 SEQUENCE OF OPERATION

A. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control and a redundant signal over the required network connection.

B. The generator set shall complete a time delay start period as programmed into the control.

C. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:

   1. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control

system shall shut down and lock out the generator set, and indicate "fail to crank" shutdown.

2. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate "fail to start".

3. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.

D. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous, synchronize, load share, load demand, or load govern state.

E. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.

F. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.

1. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

PART 4 - OTHER REQUIREMENTS

4.01 FACTORY TESTING

A. The generator set supplier 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. Factory testing may be witnessed by the owner and consulting engineer. Costs for travel expenses will be the responsibility of the owner and consulting engineer. Supplier is responsible to provide two weeks notice for testing.

C. 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.

4.02 INSTALLATION

A. 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.

B. 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.

C. 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.

D. Equipment shall be initially started and operated by representatives of the manufacturer.

E. 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 final testing of the system.

4.03 ON-SITE ACCEPTANCE TEST

A. The complete installation shall be tested for compliance with the specification following 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.

B. 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.

C. 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.

4.04 TRAINING

A. 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.

4.05 SOFTWARE

A. If proprietary software is required to program generator, Contractor shall provide a copy of the software and any applicable licenses required.

4.06 SERVICE AND SUPPORT

A. 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.

B. 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.

C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

4.07 WARRANTY

A. 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.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

4.08 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost of all work and materials specified in this Section shall be included within the lump sum bid amount for the Standby Generator and Transfer Switch as stated on the Bid Form. Payment shall include compensation for furnishing and installing the specified generator set and automatic transfer switch as well as any associated items necessary for a complete installation.

END OF SECTION

SECTION 16270 – TRANSFORMERS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Work includes providing and installing the transformer(s) as shown on the drawings and specified herein.

1.02 REFERENCE SECTIONS

A. ANSI C37.47 - Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current-Limiting Fuses.

B. ANSI/IEEE C57.13 - Requirements for Instrument Transformers.

1.03 SUBMITTALS

A. Submit shop drawings under provisions of SECTION 16050, and meeting the requirements of Section 01300.

B. Submit shop drawings indicating outline dimensions, connection and support points, weight, specified ratings and materials.

C. Submit product data under the provisions of SECTION 16010.

D. Submit product data indicating standard model design tests and options.

E. Submit manufacturer's installation instructions under provisions of SECTION 16010.

PART 2 PRODUCTS

2.01 DRY TYPE TRANSFORMERS

A. General: Provide all power transformer equipment as shown on the drawings in conformance with the following specification. All transformers shall be built in accordance with the latest revised IEEE, ANSI and NEMA standards.

B. Temperature rating: On all transformers, case temperature shall not exceed 30° C rise above an ambient temperature of 40° C. Terminal compartment shall be located to ensure termination of cable leads in temperature levels not to exceed 60° C. Transformers shall be designed for full load operation at a maximum temperature rise of 115° C.

C. Enclosure: For general application, enclosures shall be drip-proof and rodent-proof. Ventilating openings shall be louvered; screening will not be acceptable. Design shall incorporate a built-in vibration dampening system. Finish shall be ANSI 60. Conform to the limited access requirements where applicable.

D. Taps: Furnish four taps, two above and two below rated voltage, each 2 1/2 percent, for ratings above five (5) kVA.

E. Tests: Provide routine tests as listed and described in ANSI specification No. C57.12.00, latest edition. Sound level tests shall be performed on the complete transformer

assembly in accordance with the latest NEMA standards. Transformer 0-50 kVA shall conform to NEMA standards.

F. Transformer to be placed within Filter and Control Building shall be:

1. 277/480 Volts Wye Primary, 120/208 Volts Wye Secondary
2. 15 kVA
3. 115° C temperature rise
4. Wall mounted
5. Minimum K-Factor of 13.
6. Three Phase
7. Federal Pacific Catalog T4T15BK13E; or equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements are as shown.

B. Verify that required utilities are available, in proper location and ready for use.

C. Beginning of installation means installer accepts conditions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install safety labels to NEMA 260.

C. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.

3.03 FIELD QUALITY CONTROL

A. Test transformer to ANSI/IEEE C57.12.90.

3.04 ADJUSTING

A. Adjust primary taps so that secondary voltage is within 2 percent of rated voltage.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Unless otherwise specified on the Bid Form, all items specified in this section are to be included within the lump sum bid for Electrical Improvements as stated on the Bid Form. No additional payment will be made for items in this section.

END OF SECTION

SECTION 16410– ENCLOSED SWITCHES AND BREAKERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all disconnects, fused and unfused, required by code for equipment furnished under this and other Divisions of these specifications.

PART 2 - PRODUCTS

2.01 DESCRIPTION

A. Switch shall be heavy duty type, shall be quick-make, quick-break and shall be horsepower rated. Switch shall have copper blades as required to open all ungrounded conductors and shall be single throw unless noted.

B. Enclosure shall have interlocking cover to prevent opening door when switch is closed. Interlock shall include a defeating scheme.

C. Enclosure shall be suitable for location in which mounted.

D. Fusible disconnects shall be as above with addition of fuse space and clips to accept only Class R fuses.

E. Enclosure shall have provisions for a padlock.

F. Labels.

1. All labels shall be laminated plastic and attached directly to the cover.

2. Include the following information on the labels: Load served, proper voltage and phase.

G. Main disconnect for new Control Building shall be:

1. Minimum 480 VAC, 200 amp rated.

2. NEMA Type 3R.

3. Non-fusible.

4. Three Phase w/ Neutral

5. Siemens Catalog Number HF364NR; or equal.

PART 3 - EXECUTION AND WORKMANSHIP

3.01 MOUNTING

A. Secure solidly to wall or approved mounting frame. Disconnects supported only by raceway are not acceptable.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical Improvements Complete as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

SECTION 16411– FUSES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all fuses as required. Fuses shall be UL Class R rejection type with characteristics noted below unless otherwise noted in the diagrams.

PART 2 - PRODUCT

2.01 DESCRIPTION

A. Fuses. All fuses shall be current limiting type unless specified otherwise. Class K1 for all except motor circuits; Class K5 motor load type for motors. Provide 10% spare fuses, but not less than ten (10) of any one size and type.

B. Provide a laminated plastic label and attach directly to the cover of fused enclosures.

PART 3 - EXECUTION

3.01 DESCRIPTION

A. Fuses. Install in all fusible devices provided under this contract.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical Improvements Complete as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

DIVISION 16415 – AUTOMATIC TRANSFER SWITCH (ATS)

PART 1 - GENERAL

1.01 SCOPE

A. Provide complete factory assembled power transfer equipment with field programmable digital electronic controls designed for fully automatic operation and including: surge voltage isolation, voltage sensors on all phases of both sources, linear operator, permanently attached manual handles, positive mechanical and electrical interlocking, and mechanically held contacts for both sources.

B. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for all the products provided. Technicians specifically trained to support the product and employed by the generator set supplier shall service the transfer switches. Technicians shall have passed qualification examinations on the product, and be certified by the manufacturer as capable of effectively servicing the equipment provided.

1.02 RELATED SECTIONS

A. Section 16230 – Standby Generator

B. Division 16 – Electrical

1.03 CODES AND STANDARDS

A. The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:

1. CSA 282, Emergency Electrical Power Supply for Buildings.

2. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

3. NFPA99 – Essential Electrical Systems for Health Care Facilities

4. NFPA110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems.

5. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

6. NEMA ICS10-1993 – AC Automatic Transfer Switches.

B. The transfer switch assembly shall comply with the following standards:

1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.

2. EN55011, Class B Radiated Emissions

3. EN55011, Class B Conducted Emissions

4. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity.

5. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity

6. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity

7. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity

8. IEC 1000-4-6 Conducted Field Immunity

9. IEC 1000-4-11 Voltage Dip Immunity.

10. IEEE 62.41, AC Voltage Surge Immunity.

11. IEEE 62.45, AC Voltage Surge.

12. UL1008 – Transfer Switches. Transfer switches shall be UL1008 listed. UL1008 transfer switches may be supplied in UL891 enclosures if necessary to meet the physical requirements of the project.

C. The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.04 ACCEPTABLE MANUFACTURERS

A. The Automatic Transfer Switch shall be provided by the same supplier that supplies the onsite generation equipment as a package.

B. Acceptable manufacturers of automatic transfer switches include Cummins, Onan, Caterpillar, Kohler or preapproved equal.

PART 2 - PRODUCTS

2.01 POWER TRANSFER SWITCH

A. 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 600 Volts AC minimum.

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 and at the specified voltage. 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.

B. Construction

1. Transfer switches shall be double throw, electrically and mechanically interlocked, and mechanically held in the source 1 and source 2 positions. The transfer switch shall be specifically designed to transfer to the best available source if it inadvertently stops in a neutral position.

2. Transfer switches rated through 1000 amperes shall be equipped with permanently attached manual operating handles and quick break, quick make over center contact mechanisms. Transfer switches over 1000 amperes shall be equipped with manual operators for service use only under de-energized conditions.

3. Main switch contacts shall be high pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.

4. 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.

5. Power transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.

6. Transfer switches designated on the drawings as 4 pole shall be provided with a switched neutral pole. The neutral pole shall be of the same construction and have the same ratings as the phase poles. All poles shall be switched simultaneously using a common crossbar. Substitute equipment using overlapping neutral contacts is not acceptable.

7. Enclosures shall be UL tested and NEMA 1 type rated. The enclosure shall provide NEC wire bend space when both sources and the load are all connected from either the top or bottom of the transfer switch. The cabinet door shall be key-locking.

C. 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 AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the drawings.

2.02 TRANSFER SWITCH CONTROL

A. Operator Panel. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The operator panel shall be a sealed membrane panel rated NEMA 3R/IP53 or better (regardless of enclosure rating) that is permanently labeled for switch and control functions. The operator panel shall be provided with the following features and capabilities.

1. High intensity LED lamps to indicate the source that the load is connected to (source 1 or source 2); and which source(s) are available. Source available LED

indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control.

2. High intensity LED lamps to indicate that the transfer switch is "not in auto" (due to control being disabled or due to bypass switch (when used) enabled or in operation) and "Test/Exercise Active" to indicate that the control system is testing or exercising the generator set.

3. "OVERRIDE" pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and retransfer and immediately proceed with its next logical operation.

4. "TEST" pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.

5. "RESET/LAMP TEST" push-button that will clear any faults present in the control, or simultaneously test all lamps on the panel by lighting them.

6. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via a PC-based service tool and an operator display panel.

7. Analog AC meter display panel, to display AC Amps, AC Volts, Hz, KW load level, and load power factor. The display shall be color-coded, with green scale indicating normal or acceptable operating level, yellow indicating conditions nearing a fault, and red indicating operation in excess of rated conditions for the transfer switch.

8. Vacuum fluorescent alphanumeric display panel with push-button navigation switches. The display shall be clearly visible in both bright (sunlight) and no light conditions. It shall be visible over an angle of at least 120 degrees. The Alphanumeric display panel shall be capable of providing the following functions and capabilities:

    a. Display source condition information, including AC voltage for each phase of normal and emergency source, frequency of each source. Line to neutral voltages shall be displayed.

    b. Display source status, to indicate source is connected or not connected.

    c. Display load data, including AC voltage, AC current, frequency, KW, KVA, and power factor. Voltage and current data for all phases shall be displayed on a single screen.

    d. The display panel shall allow the operator to view and make the following adjustments in the control system, after entering an access code:

        i. Set nominal voltage and frequency for the transfer switch.
        ii. Adjust voltage and frequency sensor operation set points.
        iii. Set up time clock functions.
        iv. Set up load sequence functions.
        v. Enable or disable control functions in the transfer switch, including program transition.

vi. Set up exercise and load test operation conditions, as well as normal system time delays for transfer time, time delay start, stop, transfer, and retransfer.

e. Display Real time Clock data, including date, and time in hours, minutes, and seconds. The real time clock shall incorporate provisions for automatic daylight savings time and leap year adjustments. The control shall also log total operating hours for the control system.

f. Display service history for the transfer switch. Display source connected hours, to indicate the total number of hours connected to each source. Display number of times transferred, and total number of times each source has failed.

g. Display information for other transfer switches in the system, including transfer switch name, real time load in KW on the transfer switch, current source condition, and current operating mode.

h. Display fault history on the transfer switch, including condition, and date and time of fault. Faults to include controller checksum error, low controller DC voltage, ATS fail to close on transfer, ATS fail to close on retransfer, battery charger malfunction, network battery voltage low, network communications error.

B. Internal Controls

1. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600VAC. Provide RMS voltage sensing and metering that is accurate to within plus or minus 1% of nominal voltage level. Frequency sensing shall be accurate to within plus or minus 0.2%. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.

2. Transfer switch voltage sensors shall be close differential type, providing source availability information to the control system based on the following functions:

a. Monitoring all phases of the normal service (source 1) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of normal voltage level).

b. Monitoring of the emergency service (source 2) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of pickup voltage level).

c. Monitoring of the normal service (source 1) and emergency service (source 2) for voltage imbalance.

d. Monitoring of the normal service (source 1) and emergency service (source 2) for loss of a single phase.

e. Monitoring of the normal service (source 1) and emergency service (source 2) for phase rotation.

f. Monitoring of the normal service (source 1) and emergency service (source 2) for over voltage conditions (adjustable for dropout over a range of 105 to 135% of normal voltage, and pickup at 95-99% of dropout voltage level).

g. Monitoring of the normal service (source 1) and emergency service (source 2) for over or under frequency conditions.

h. Monitoring the neutral current flow in the load side of the transfer switch. The control shall initiate an alarm when the neutral current exceeds a preset adjustable value in the range of 100-150% of rated phase current for more than an adjustable time period of 10 to 60 seconds.

3. All transfer switch sensing shall be configurable from a Windows PC-based service tool, to allow setting of levels, and enabling or disabling of features and functions. Selected functions including voltage sensing levels and time delays shall be configurable using the operator panel. Designs utilizing DIP switches or other electromechanical devices are not acceptable. The transfer control shall incorporate a series of diagnostic LED lamps.

4. The transfer switch shall be configurable to control the operation time from source to source (program transition operation). The control system shall be capable of enabling or disabling this feature, and adjusting the time period to a specific value. A phase band monitor or similar device is not an acceptable alternate for this feature.

5. The transfer switch shall incorporate adjustable time delays for generator set start (adjustable in a range from 0-15 seconds); transfer (adjustable in a range from 0-120 seconds); retransfer (adjustable in a range from 0-30 minutes); and generator stop (cooldown) (adjustable in a range of 0-30 minutes).

6. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.

7. The transfer switch shall provide a relay contact signal prior to transfer or retransfer. The time period before and after transfer shall be adjustable in a range of 0 to 50 seconds.

8. The control system shall be designed and prototype tested for operation in ambient temperatures from -40C to +70C. It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.

9. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

10. The transfer switch network monitoring equipment, when supplied, shall be provided with a battery based auxiliary power supply to allow monitoring of the transfer switch when both AC power sources are non-operational. The battery power supply shall be monitored for proper condition, and the transfer switch shall include an alarm condition to indicate low battery condition.

C. 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.

4. The transfer switch shall be provided with an Ethernet port for SCADA monitoring and control of the Generator set.

2.03 ENCLOSURE

A. Enclosures shall be UL listed. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70. The cabinet door shall include permanently mounted key type latches.

B. Transfer switch equipment shall be provided in a NEMA 1 or better enclosure.

C. 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.

PART 3 - OPERATION

3.01 OPEN TRANSITION SEQUENCE OF OPERATION

A. 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.

B. 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:

1. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.

2. The transfer switch shall issue a compatible start command to the generator set, and cause the generator set to start and run at idle until it has reached normal operating temperature.

3. When the generator set has reached normal operating temperature or after an adjustable time period (whichever is shorter), the control system shall accelerate the generator set to rated voltage and frequency.

4. 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.

5. 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 loads to the normal service.

6. 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.

7. 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.

C. 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:

1. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.

2. The transfer switch shall issue a compatible start command to the generator set, and cause the generator set to start and run at idle until it has reached normal operating temperature.

3. When the generator set has reached normal operating temperature or after an adjustable time period (whichever is shorter), the control system shall accelerate the generator set to rated voltage and frequency.

4. 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.

5. 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 4 - OTHER REQUIREMENTS

4.01 FACTORY TESTING.

A. The transfer switch manufacturer shall perform a complete operational test on the transfer switch prior to shipping from the factory. A certified test report shall be available on request. Test process shall include calibration of voltage sensors.

4.02 SERVICE AND SUPPORT

A. The manufacturer of the transfer switch shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.

B. The transfer switch shall be serviced by a local service organization that is trained and factory certified in both generator set and transfer switch 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.

C. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.

D. The manufacturer shall supply to the facility owner two (2) complete sets of service and maintenance software for use in properly supporting the product. The software shall be provided at a training class attended by the user, to qualify the user in proper use of the software. The software shall have the following features and capabilities:

1. The software shall be Windows compatible.

2. The software shall use the Windows "Explorer" format, for ease of use and commonality with other software in use at the facility.

3. The software shall allow adjustment of all functions described herein via the tool; adjustment of operating levels of all protective functions; and programming of all optional functions in the controller. Adjustments shall be possible over modem from a facility that is remote from the generator set.

4. The software shall allow simulation of fault conditions, to verify operation of all protective devices

5. The software shall include the ability to store and display data for any function monitored by the generator set control. This data shall be available in common file formats, and on graphical "strip chart" displays.

6. The software shall automatically record all control operations and adjustments performed by any operator or software user, for tracking of changes to the control.

7. The software shall display all warning, shutdown, and status changes programmed into transfer switch controller. For each event, the control shall provide information on the nature of the event, when it last occurred, and how many times it has occurred.

8. The software shall include detailed operation and service information on the specific generator set supplied, so that no other documentation (other than schematic and wiring diagram drawings) is necessary for service of the product.

E. 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.

4.03 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost of all work and materials specified in this Section shall be included within the lump sum bid amount for the Standby Generator and Transfer Switch as stated on the Bid Form. Payment shall include compensation for furnishing and installing the specified generator set and automatic transfer switch as wall as any associated items necessary for a complete installation.

END OF SECTION

SECTION 16420 – ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide a complete control system, including motor controls, PLC, HMI, autodialer, relay controls and running software. The running software (ladder logic, screen setups, etc., shall be provided by the Software Integrator under another Section). Provide the PLC hardware and assemblies consisting of all the components shown in the diagrams along with manuals, cables, program development software, O&M manuals, etc., to implement the control system.

B. System shall operate on an Ethernet based system to allow future integration into a city-wide SCADA system as describe in the SCADA Master Plan.

C. Provide a Master Control Panel (MCP) as shown on the drawings, for housing the PLC and general control circuits.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. The City requires that the PLC, HMI, and associated equipment be manufactured by Allen-Bradley, model and series as specified. No substitutions or schematic changes will be accepted without approval by the Engineer.

B. The Contractor shall provide an integrated control system which shall be the product of one manufacturer who has had at least five years experience in furnishing similar equipment. It shall be completely tested and inspected prior to shipment. All equipment shall be guaranteed against defects of materials and workmanship for a period of one year from date of job acceptance. Manufacturer shall maintain a service organization in Oregon with factory trained personnel available, and who shall stock parts for this equipment. Control system shall be UL508 labeled.

2.02 COMPONENTS

A. Provide all controls and automation equipment necessary to make a completely functional system.

B. Provide all equipment shown on the contract drawings.

C. Provide loop isolators as may be required, whether shown on the drawings or not.

D. Provide intrinsically safe barriers and relays as may be required. See drawings.

E. Laminated nameplates shall indicate all controller operations and shall label all panels and enclosures. See the electrical drawings for the ID tag schedule.

1. Panel Nameplates. Material shall be laminated plastic fastened to the panel with stainless steel screws. Letters ½" white on black background.

2. Component Nameplates. Material shall be laminated plastic fastened by adhesive. Letters 3/16" white on black background.

F. Stainless Steel Equipment ID Tags shall identify miscellaneous equipment. See the electrical drawings for the ID tag schedule. Devices shall be tagged with engraved or embossed stainless steel tags attached by stainless steel beaded chain.

G. All painting shall be in a first class craftsmanship manner. Paint finish shall be smooth and free from rough surfaces such as sand, dust and scratches.

H. Panels arriving to job site shall be inspected for scratches, dents, etc. Any panel found unacceptable shall be returned to panel manufacturer for repainting at panel suppliers and manufacturer's expense.

I. Components shall be DIN rail mountable.

J. A panel mounted MOV surge protector shall be installed to protect all electronics.

K. Battery backup in the form of a UPS (Uninterruptable Power Supply) shall be provided and shall maintain 10 Amps of current at 24 Volts for 15 minutes. It is acceptable to provide a UPS integrated into the power supply. Supply must have a MTBF of 200,000 hrs minimum according to MIL-HDBK-217F.

2.03 PLC MODULES. SEE DIAGRAMS.

A. PLC manufacturer shall be Allen Bradley, model series CompactLogix 1769-L23E-QBFC1B; or approved equal.

B. PLC shall communicate with a minimum of one Ethernet/IP port and one RS-232 port.

C. A minimum of 8 analog inputs (4-20mA), 32 digital inputs (24V), 16 digital outputs (24V), 2 analog outputs shall be provided. Contractor shall provide expansion modules as needed to meet the requirements of the control system.

D. PLC modules shall operate on 24V DC power. Power supplies of the same manufacturer shall be provided to meet the power consumption of all panel components and the PLC.

E. A minimum of 512KB of user memory shall be available.

2.04 AUTODIALER

A. Autodialer shall be Express II as manufactured by Sensaphone.

B. Autodialer shall be capable of communicating over landline phone..

C. Upon receipt of one or more critical alarm trips, electronic system will automatically dial out onto phone system (up to 48 specified telephone numbers from one of 3 phone lists) with pre-programmed messages.

D. System shall continue calling until call completed and acknowledged.

E. Physical Inputs: Units requiring physical inputs shall be field upgradeable to incorporate from 8 to 40 dry contacts or analog inputs in any combination. Any input in violation of a normal condition shall cause the unit to go into alarm status and begin the dial-out sequence.

F. The dialer shall be covered by a one(1) year warranty covering parts and labor performed at the Factory.

G. Dialer shall have a 12 hour battery backup.

H. Unit shall have an RS232 port for printer or datalogging connections.

I. A user shall be able to view the current status of the remote unit through the Internet, request an immediate update of the status and set pre-defined times that the status should automatically be transferred and stored on the Internet.

J. Mandatory Alarm Sets:

1. Wetwell Overflow
2. Wetwell Hi Level
3. Wetwell Lo Level
4. Pump Failure
5. PLC Failure
6. Power Failure
7. Generator Failure
8. Intrusion Alarm

K. Alarms can be communicated from PLC outputs but Wetwell Hi Level and Wetwell Overflow must also be hardwired to alarms in case of PLC failure

2.05 HMI DISPLAY

A. HMI Display shall be Allen Bradley, model Panelview Plus 1000; or approved equal.

B. Display shall be touch style color screen with a minimum display size of 10".

C. Display resolution shall be a minimum of 640x480 with 16 bit color depth.

D. HMI shall be mounted to the front of the PLC enclosure for access by operators.

E. Screen shall have a field replaceable backlight

F. A battery backup real time clock shall be supplied and timestamp critical data.

G. Memory shall be supplied through flash RAM.

2.06 PLC SOFTWARE PROGRAMMING. SEE SECTION 16421.

PART 3 - EXECUTION

3.01 COORDINATION W/ SOFTWARE INTEGRATOR

A. Electrical Contractor shall coordinate with and provide assistance to the Software Integrator (programmer) (see Section 16421).

END SECTION

SECTION 16421 – PLC, HMI, AND SCADA PROGRAMMING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Complete System. The Contractor shall provide a complete, functioning, finished control system, including ladder logic programs for the PLC, custom designed operator interface screens for the HMI, and a tags memory space in the PLC for transferring status and alarms over the radio telemetry system. The finished work shall be operator-friendly and acceptable to the Engineer and Customer.

1.02 WORK INCLUDED

A. Program the PLC and all PLC modules.

B. Program the HMI.

C. Program the Autodialer.

D. Produce a basic users manual.

E. Program the system so that in the future it is ready to connect to a SCADA system.

1.03 PAYMENT FOR WORK.

A. Payment for work under this Division shall be covered and included as part of the lump sum for Electrical on the project, or as outlined under any schedules.

PART 2 - PRODUCTS

2.01 PURCHASED MATERIALS

i. The Contractor shall supply all cables, manuals, etc., necessary for the completion of the work. The Software Integrator will not be responsible for purchasing any materials.

PART 3 - EXECUTION

3.01 DELIVERED DOCUMENTATION.

A. Provide (3) binders, each containing the following:

1. CD w/ copies of all the files developed under this section

2. Control Manual, describing how to use the controls and a listing of alarm messages and their meanings w/ troubleshooting tips.

3. PLC ladder logic listings, fully annotated and commented.

4. HMI screen shots and configuration listings.

5. Autodialer configurations and manual.

3.02 HMI OPERATIONS

A. Operator Interface Terminals (HMI). The HMIs shall display information in a graphic, pictorial, format. Status and set-point screens shall be available by intuitive screen navigation buttons.

B. Processes Monitored. The PLCs shall be programmed to monitor and display on the operator interface terminal wet well levels, flows, pump status, running times, alarms, etc.

3.03 PLC OPERATIONS

General. The PLC shall be programmed to automatically resume plant operations after a power interruption and to bring all plant loads online in a sequential fashion so as to prevent high peak power loading. This timed startup shall be executed on each load that has its MCC selector switch set to AUTO (or REMOTE). Loads which are in HAND or MANUAL shall not be under PLC control. The PLC shall keep track of running time of all monitored loads and present that information on appropriate HMI screen(s) even if there is a physical elapsed time meter connected to the load. Each load that is running in AUTO (or REMOTE) and is therefore under PLC control shall be automatically stopped if the PLC detects a loss of phase or overload.

A. Effluent Pumps. The PLC shall control the effluent pumps as described in Section 17500: "Operational and Alarm Strategy."

3.04 PLC ALARM FUNCTIONS.

A. General. The PLC shall monitor the status of the pumps and equipment and report phase loss failures, overloads, failure to run, high or low wet wells, power outages, last pump is running, overflow, loss of standby pump, etc. When an alarm condition is detected the PLC shall display the alarm status screen on the HMI, turn on the horn (if available) and the ALARM light.

B. Scope. Alarms shall be processed for all pertinent inputs available to the PLC.

3.05 COMPLETE SYSTEM.

A. This Division contains a rudimentary description of the PLC, HMI and PC software. The Contractor shall be responsible for designing a complete software system that is documented, operator-friendly and acceptable to the Customer and Engineer.

END OF SECTION

SECTION 16424 – VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 SCOPE

A. Provide variable frequency drives (VFDs) for devices as indicated on drawings or other Sections of Specifications. Locate as per drawings.

1.02 CODES AND STANDARDS

A. The Drive manufacturing facility shall be ISO 9001 and 14001 certified.

B. The VFD shall be UL listed.

1.03 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers are Allen Bradley Powerflex 400.

1.04 SUBMITTALS

A. The Variable Frequency Drive proposed for this Section must be pre-approved through the pre-bid submittal process as outlined in Section 01300.

1.05 TESTING AND QUALITY ASSURANCE

A. All printing circuit boards shall be completely testing and burned-in before being assembled into the completed Drive. The Drive shall then be subjected to a preliminary functional test, minimum one hour burn-in and computerized final test. The burn-in shall be at 104°F, at full rated load, or cycled load. Drive input power shall be continuously cycled for maximum stress and thermal variation.

B. Drive manufacturer shall conduct complete electrical testing, component x-ray, component decap or delamination and failure analysis by qualified individuals in the case of drive component failure.

PART 2 - PRODUCTS

2.01 DRIVE GENERAL REQUIREMENTS

A. Drive shall be solid state, with a Pulse Width Modulated (PWM) output. The drive shall be a Sensorless Vector AC to AC converter utilizing isolated gate bipolar transistor (IGBT) technology. Drive shall employ a Sensorless Vector inner loop torque control strategy that mathematically determines motor torque and flux. The drive must also provide an optional operational mode for V/Hx or closed loop Flux Vector Operation. Drive shall be supplied with integral input disconnect switch and fast acting, current limiting fuses.

B. Control Function and Adjustment

1. Start up data entries shall include motor nameplate power, speed, voltage, frequency and current.

2. A motor parameter ID function shall automatically define the motor equivalent circuit used by the sensorless vector torque controller.

3. Independent PID speed/torque loop regulators shall be provided with an auto-tune function as well as manual adjustments.

4. Carrier frequency shall be adjustable between 1 and 12 kHz. The VFD shall automatically adjust to the highest carrier frequency based on drive temperature and load.

5. The VFD shall be capable of starting into a coasting load (forward or reverse) and accelerate or decelerate to reference without safety tripping or component damage (flying start). The VFD shall also be capable of flux braking at start in order to stop a reverse spinning motor prior to ramp.

6. The VFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.

7. Accel/Decel control functions shall include two sets of ramp time adjustments with linear and two s-curve ramp selections.

8. Drive shall be controlled by a remote PLC over network communication for normal operation. In addition manual controls shall be initiated by an emergency bypass float and relay control system as shown in Contract drawings.

9. Drive shall be mounted in a UL listed Nema 12 gasketed enclosure provided with cooling fans. The enclosure shall include line reactors, contactors, hand/off/auto controls, a bypass and test mode and house additional controls needed for emergency functions.

10. Drive cabinet shall be hinged with a latching handle mechanism to access the drive and electrical connections.

11. Drive shall include a main circuit breaker disconnect with a rating according to manufacturers recommendations.

12. Bypass Switch, Hand/Off Auto Switch, Main Breaker Disconnect, Operator Interface, and mode indicating lights shall be accessible from exterior of drive enclosure without opening the cabinet.

C. Ratings and Protective Functions

1. Drive shall be rated to operate from 3-phase power at 480 VAC and 60 Hz. Drive shall employ a full wave rectifier to prevent input line notching and operate at a fundamental (displacement) input power factor of 0.95 at all speeds and loads. Drive efficiency shall be 96% or better at full speed and load.

2. Drive shall be sized to power a 25HP motor in 3-phase applications..

3. An internally mounted, 5% impedance AC line reactor or DC choke shall be provided to reduce input current harmonic content, provide protection from power transients and reduce RFI emissions. DC choke shall be swinging choke design and shall provide a minimum of 5% impedance.

4. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute out of 10 minutes, 180% overload for 2 seconds out of 1 minute, with an instantaneous over-current trip at 350% or higher. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430-150 for 4-pole motors.

5. The VFD shall include internal MOV's for phase to phase and phase to ground line voltage transient protection.

6. Open loop static speed regulation shall be 0.5% to 1% of rated motor speed. When motor speed feedback is provided from a suitable encoder, closed loop speed regulation shall be 0.01% or better. Dynamic speed accuracy shall be 3%-sec or better open loop and 0.3%-sec or better closed loop.

7. Torque response time shall be 10 ms or less. In the torque regulating mode, torque regulating accuracy shall be 5% or better.

8. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.

9. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows the highest carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.

10. The drive shall include electronic motor overload protection qualified per UL508C.

11. Protection shall be provided for AC line or DC bus over-voltage at 130% of maximum rated or under-voltage at 65% of minimum rated and input phase loss.

12. A power loss ride through feature shall allow the drive to remain fully operational after losing power as long as kinetic energy can be recovered from the rotating mass of the motor and load.

13. Over-temperature protection shall provide a warning if the power module temperature is less than 5°C below the over-temperature trip level.

14. The VFD shall be capable of sensing a loss of load (broken coupling) and signal a loss of load condition. The drive shall be programmable to signal this condition via a keypad warning, and relay output. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false under-load condition.

15. A drive input contactor and a drive output contactor shall open and close the connection between the drive and motor.

D. Adjustments and I/O

1. Two programmable analog inputs, each selectable for 0 VAC to 10 VAC or 4mA to 20mA and independently programmable with at least ten input function selection. Analog input signal processing functions shall include scaling adjustments, adjustable filtering and signal inversion. If the input reference is lost, the VFD shall give the user the option of the following:

   a. Stopping and displaying a fault

   b. Running at a programmable preset speed

   c. Hold the VFD speed based on the last good reference received

d. Cause a warning to be issued

The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communication bus.

2. At least two programmable digital inputs shall be available for calling the drive into emergency operation or emergency stop. The inputs shall be capable of receiving a 24 volt signal supplied by the internal supply of the drive.

3. Two analog outputs providing 4 mA to 20 mA signals. Outputs shall be independently programmable to provide signals proportional to at least 12 output function selections including output speed, frequency, voltage, current and power.

4. The drive shall be provided with an Ethernet communications port for default operation and control by station PLC.

5. The VFD shall have two independently adjustable accel and decel ramps with 1 – 1,800 seconds adjustable time ramps.

6. The VFD shall have programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.

E. Operator Interface (Control Panel)

1. The Keypad shall include a backlit LCD display. The display shall be in complete English words or standard English abbreviations for parameter names, warnings, programming and fault diagnostics (alpha-numeric codes are not acceptable). The keypad shall utilize the following assistants:

   a. All applicable operating values shall be capable of being displayed in engineering (user) units. The display shall be in complete English words (alpha-numeric codes are not acceptable).

2. EMI / RFI filters. All VFDs shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and shall meet product standard EN 61800-3 for the First Environment restricted level.

3. The control panel shall provide a real time clock for time stamping events and fault conditions.

4. The standard operator panel shall provide a start-up, maintenance and diagnostic assistants that guides a new user through initial start-up and commissioning of the drive as well as provide indications for maintenance and help to diagnose a fault.

5. Enclosure exterior shall include a 24V mechanical hour meter connected to a drive output and record all pump run times when not in bypass mode.

6. A Hand/Off/Auto switch with indicator light lamps and a Bypass/Test/Run switch with mode indicator lamps shall be provided. Switches and lamps shall be clearly labeled.

7. Operator Interface shall be mounted on exterior of enclosure/MCC for operator use without opening control enclosure.

2.02 SPECIFIED DRIVE MODEL

A. Drive will accept three phase 480VAC input and output to a 3-phase 20Hp motor.

B. Allen Bradley Powerflex 400 Model 22C-D022N103 base drive model.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install as per the contract drawings, manufacturers' recommendations, and in accordance with all applicable code and ordinance.

3.02 START-UP

A. Certified factory start-up shall be provided for each drive by a factory authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the Owner and a copy to be kept on file at the service center.

B. Manufacturer's certified personnel shall program the VFDs to match the pump load characteristics to integrate with other systems.

3.03 SUPPORT

A. Factory trained application engineering and service personnel that are thoroughly familiar with the Drive products offered shall be locally available at both the specifying and installation locations.

3.04 WARRANTY

A. Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment. The warranty shall include all parts, labor, travel time and expenses. There shall be 365/24 support available via a toll free phone number.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost of all work and materials specified in this Section shall be included within the lump sum bid amount for bid item Electrical as stated on the Bid Form. No separate measurement or payment for items in this Section will be allowed.

END OF SECTION

SECTION 16440– SWITCHBOARDS, PANELBOARDS AND MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Provide all equipment shown on the drawings.

B. Provide complete assemblies with main breakers, distribution circuit breakers, sub-distribution panels, motor controls, starters relays, time clocks, switches, controls, etc., in a complete assembly as shown on drawings and outlined in specifications for motor control center assemblies. The Motor Control Center (MCC) shall be manufactured by Siemens/Furnas (Model Tiastar), Allen-Bradley, or as approved by Engineer.

C. Provide circuit breakers with sufficient interrupting capacity per the utility company service available fault current estimate (see drawings for rating).

1.02 REFERENCES

A. Study the contract drawings carefully, including elevation views as well as the one-line drawing.

PART 2 - PRODUCTS

2.01 GENERAL PANEL REQUIREMENTS

A. Main electrical control panels shall be housed in a NEMA 12 gasketed enclosure of the size shown on the contract drawings. Panels shall, in general, be made up of manufacturer's standard depth modules, not to exceed 20", as shown on plans. Deviations may be permitted if uniform panel appearance is presented. All sections of modules including switchgear sections shall be perfectly aligned to look like one complete unit when assembled. Wiring terminal Class II Type C. Panels shall be designed, manufactured, assembled at the factory, and tested in accordance with the latest applicable standard of NEMA, ATEE, and ASA. The vertical sections and the individual units shall bear a UL label as evidence of compliance with UL Standard 845. Service equipment shall be UL labeled as suitable for the application.

B. Laminated nameplates shall indicate all controller operations and the panel shall be primed and painted with Dupont Dulux Alkyd Enamel or approved paint, with custom color. The back panels of draw out units shall be painted white enamel. All painting shall be in a first class craftsmanship manner. Paint finish shall be smooth and free from rough surfaces such as sand, dust and scratches. Custom color selection shall be by Engineer.

C. Panels arriving to job site shall be inspected for scratches, dents, etc. Any panel found unacceptable shall be returned to panel manufacturer for repainting at panel suppliers and manufacturer's expense.

D. The main electrical characteristics of the motor control centers for the project shall be suitable to operate at the voltages, phase and frequency as outlined on the electrical drawings. Electrical characteristics of lighting and distribution panels shall be as shown on drawings. All MCC bus shall be braced to withstand a fault current at the motor control center terminals of 65,000 amperes RMS symmetrical. All bus shall be copper.

E. See electrical drawings for motor control centers layouts and positioning of pilot and other devices. Provide door latches and key locks on full-section doors and others as may be shown on the drawings.

F. Main breaker panel for new Control Building shall be:

1. UL listed for 60/75° C conductors.
2. Copper bus.
3. NEMA Type 12, gasketed.
4. 277/480 VAC, 3-phase, 4-wire, 100 amp rated.
5. Designed for a minimum of 30 single-pole or 10 three-pole branch circuits.
6. Siemens Catalog Number P2E30BL100CBS; or equal.

G. Sub breaker panel for new Control Building shall be:

1. UL listed for 60/75° C conductors.
2. Copper bus.
3. NEMA Type 12, gasketed.
4. 120/208 VAC, 3-phase, 4-wire, 100 amp rated.
5. Designed for a minimum of 18 single-pole or 6 three-pole branch circuits.
6. Siemens Catalog Number P2C18BL100CBS; or equal.

H. Outdoor wetwell panel shall be:

1. UL listed 508 listed.
2. NEMA Type 4X, 316 Stainless, 14 gauge
3. Installed with a interior divider to separate DC and AC signals.
4. Concealed Hinges and ¼ turn latches
5. 24" X 24"x8" in size.
6. 3 point 316SS padlocking handle
7. Termination lugs for the various level and alarm signals as well as the pump power cabling shall be installed inside the panel.
8. Wiegmann Catalog Number N412242408SS3PTC; or equal.
9. Back panel Weigmann Catalog Number NP2424SSC

2.02 PANEL LIGHTING AND DISTRIBUTION BOARDS

A. Panelboards shall have as a minimum the number of branch spaces as listed on the riser diagram or panel schedules listed in this Division or on the diagrams.

B. Panelboards shall be an integral part of the main distribution and MCC unless remote mounted, where they shall be of conventional, wall mounted type. Any mounted outdoors shall be of type and design so as to be protected in that location.

C. Electrical characteristics shall be as listed on Riser Diagram or panel schedule listed in this Division.

D. All breakers shall be bolt in quick-make, quick-break, ambient compensating with a minimum of 10,000 amp interrupting capacity, and as required by code and the interrupting current requirements of the source. General Electric, Square D, Westinghouse, Siemens, Cutler Hammer, or ITE.

E. Identification cards in panel doors shall be machine printed to identify all circuits. Spare blank cards shall also be provided in each door. Panels shall be fitted with flush lift latches and shall have hinges on the side rather than on the top. Outdoor enclosures shall have full piano hinges and shall be gasketed.

F. Ground fault circuit interrupters (GFCI) designed to protect against hazards caused by ground faults shall be compatible with other adjacent breakers in the panel. GFCI shall be used where required by code or where indicated on drawings and in panel schedules. GFCI breakers shall have the same characteristics as breakers described above.

G. Door and key lock. Panels inside lockable buildings shall not require locking doors. All other panels shall require locking doors, keyed alike with the MCC doors.

H. Master keying for cabinet door locks.

I. Engraved nameplate for panelboard.

J. Color to match main distribution panel or adjacent walls. Consult with Engineer.

2.03 CURRENT TRANSFORMER AND METERING CABINETS

A. Acceptable to the serving power company as to size, style, etc.

B. Bar type current transformer cabinet shall be utilized in all cases unless specifically called out differently by serving utility.

C. Single meter cabinet required for Control Building. Cabinet shall be:

1. Designed to receive watt-hour meters that meet ANSI C12.10

2. NEMA 4X construction

3. 600 Volt, 3-phase, 4 wire, 200 amp rated

4. Cooper B-Line, Catalog No. 117SS; or equal.

2.04 CONTROL CENTER CABINETS

A. Acceptable for housing PLC, HMI, control relays, DC power supplies and all communication equipment.

B. Integrated Unit-strut mounting channels welded to body interior for positioning of back panels.

C. Single cabinet required for Control Building. Cabinet shall be:

1. UL 508 listed

2. NEMA 12 construction

3. Single Locking Door floor mounted

4. 60 inches high, 24 inches wide, 18 inches deep

5. Fabricated from 12 gauge steel

6. Wiegmann, Catalog No. WA602418FS; or equal.

PART 3 - EXECUTION

3.01 SUBMITTAL

A. Panelboards shall be ordered which comply with both the one-line drawings and the elevation drawings depicting section assignments. Contractor shall provide a detailed submittal to the Engineer and obtain Engineer's approval of the proposed motor control centers before ordering them. Submittal shall be included in the post-bid submittal package discussed elsewhere in these documents.

3.02 CONDUIT ACCESS

A. Provide proper conduit terminations at locations shown in the drawings or as required for workmanlike routing of conduit runs.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

SECTION 16478 – TRANSIENT VOLTAGE SURGE SUPPRESSOR

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work required under this division shall include all materials, labor and auxiliaries required to and install one surge suppressor for the protection of building electrical and electronic systems from the effects of line and electromagnetic induced transient voltage surges and coupled lightning discharged transients as indicated on drawings or as specified in this section.

1.02 REFERENCE SECTIONS

A. UL 1449 3rd Ed. Sept 2009 – Standard for Safety for Transient Voltage Surge Suppressors

B. ANSI/IEEE C62.41 – Recommended Practice for Sure Voltages in Low Voltage AC Power Circuits

1.03 SUBMITTALS

A. Submit shop drawings under provisions of SECTION 16050, and meeting the requirements of Section 01300.

B. Submit product data under the provisions of SECTION 16010.

C. Submit product data indicating standard model design tests and options.

D. Submit manufacturer's installation instructions under provisions of SECTION 16010.

1.04 QUALIFICATIONS

A. Equipment certification: Items shall be "Listed" by Underwriters Laboratories, Inc. and shall exhibit the UL Listing Mark for the category "Transient Voltage Surge Suppressors" or TVSS. UL Listing Card under category TVSS shall be provided to confirm compliance to UL1449 Second Edition Standard and assigned Suppressed Voltage Ratings.

B. Surge Protective Devices shall be installed and located in accordance with the requirements of all applicable National Fire Protection Association (NFPA) codes. The device shall be installed on the load-side of the main service disconnect per the scope of UL 1449 Standard for Safety for Transient Voltage Surge Suppressors.

C. Manufacture shall have a minimum of ten (10) years of experience in the manufacture and service of TVSS devices.

PART 2 PRODUCTS

2.01 TVSS Surge Protector

A. General: Provide primary service panel TVSS devices as shown on the drawings in conformance with the following specification. All surge devices shall be built in accordance with the latest revised IEEE, ANSI and NEMA standards.

B. Temperature rating: Shall be designed to have an operating temperature from -10 to +60 degrees C.

C. Enclosure: Shall be NEMA 12, or 4X rated.

D. Operating Voltage: Surge Protectors shall be designed for the specific type and voltage of the electrical service as indicated in drawings, and provide suppression for L-L, L-G, L-N of 1000 volts and shall be configured to operate at 277/480 Volt 3-phase Wye.

E. Short circuit rating: 100kA RMS symmetrical amps.

F. Testing: Shall be UL 1449 listed.

G. Diagnostics: Shall include LED lights to indicate operation and alarm. Include dry contact for monitoring

H. Manufacturer: Shall be model RCHW as manufacturer by Meter-Treater; or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions. One single device shall be installed.

B. Install in position as shown in Contract Drawings, connected to the top of the primary service panel, where the transfer switch connection is made.

C. Properly ground connection to conduct surges from the main bus. Wire leads should be short as possible and avoiding tight bends.

D. Use 60 amp 3-pole breaker for panel connection.

E. Installation of this device shall not be construed to eliminate other secondary surge suppression, such as that providing by other equipment, in the control panel, or provided by motor drives.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Unless otherwise specified on the Bid Form, all items specified in this section are to be included within the lump sum bid for Electrical as stated on the Bid Form. No additional payment will be made for items in this section.

END OF SECTION

SECTION 16490 – COMPONENTS AND ACCESSORIES

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Provide the following components and accessories.

PART 2 - PRODUCTS

2.01 WATER LEVEL FLOATS

A. Wet well floats that are installed in the same well as a submersible level sensor are redundant backup devices. They will only be acted upon if the PLC or sensor fails.

B. Wet well floats, meter vault flood float, and check valve vault float shall be suspended, mercury, avocado style and shall open on liquid rise and close on liquid fall. They shall be UL rated, 120/240VAC. Each float shall include be tie-wrapped to a tether as shown on the drawings. Contractor shall also furnish one spare float. Floats shall be Roto-Float Type S or equivalent.

2.02 WET WELL WATER LEVEL SENSOR

A. Provide an Endress Hauser Waterpilot FMX167 submersible level sensor for measuring wet well level. This device shall have a large 42mm anti-fouling diaphragm. The sensor shall have a range of 0-15 psi (0-34.65'). It shall be a two-wire 4-20mA device.

B. Install the transducer per manufacturer's recommendations using stainless steel hardware and a long stainless steel conduit "stinger" as shown on the drawings.

C. Provide the transducer with a cable long enough that it does not have to be spliced.

D. Install sensor and transducer as per the location in the drawings.

E. All outdoor connections shall be water proof and gasketed.

2.03 VAULT SWITCHES

A. Each of the two check valves will be equipped with microswitches to indicate a closed valve condition. Connect these switches as shown on the drawings.

2.04 OUTLET PRESSURE TRANSDUCERS

A. Provide two combination pressure transmitter / gauges in the valve vault, as shown on the drawings.

B. Devices shall be Ashcroft 2279 series stainless combination pressure gauge/transmitter. Pressure range shall be 0/60 psi. 4-20ma output with waterproof cable connector.

C. Install the pressure gauge so that it can be removed without disconnecting the wiring connection. This will require ordering the gauge with a waterproof connector (included in the above part number). All wiring splices shall be in the junction box in the vault and shall be by grease filled compression connectors.

2.05 DIGITAL PRESSURE DISPLAY

A. Provide two combination digital pressure display meters flush mounted to the door of the main control panel.

B. Device shall input a 4-20ma 24VDC signal and convert it to a 3.5 digit display.

C. Display digits shall be a minimum of 14.2mm tall.

D. Display shall be have digital and potentiometer calibration control to allow tuning of the pressure range to the display.

E. Device shall be Weidmuller DI350 with current inputs, or equal.

F. Contractor shall install and calibrate to pressure gauges installed on force main headers.

G. Device shall be connected in parallel to the PLC to allow reading of gauges in event of PLC failure.

2.06 PUMP HOUR METERS

A. Provide mechanical run time meters for each pump. Meters shall be flush mounted to the door of the VFD cabinets.

B. Meters shall operate from a 24VDC output on the VFD whenever the drive is in operation.

C. Meters shall be capable of displaying a minimum of 10,000 hours plus tenths.

D. Meters shall be UL listed, sealed, quartz driven.

E. Meters shall be 85001 by Hobbs or equal.

2.07 BREAKER LOCKOUT STATION

A. Provide an OSHA approved circuit breaker lockout station, wall mounted within view of the panelboards. The station shall contain a selection of lockout hasps and color coded padlocks with keys. Each kit shall contain devices for locking out actuator handles as well as individual panelboard circuit breakers. Approved manufacturers are Brady, Master Lock, and Prinzing, or equal.

2.08 SOFTWARE

A. Provide a sealed package of the Power Flex 400 configuration software for Windows XP/VISTA, along with two programming cables for configuring the VFDs by laptop.

B. Provide the following unopened packages. Allen-Bradley model#

1. 9324-RLD300NXxxE, RSLogix5000 Standard Edition with NetWorx

2.09 EQUIPMENT ID TAGS

A. Provide equipment ID tags, both laminated plastic and embossed stainless steel, as described in the tag schedules on the electrical drawings and as described in these specifications (especially the Enclosed Controllers specifications).

2.10 ETHERNET SWITCH

A. The City requires that the Ethernet switch in the MCP be manufactured by Hirschmann, model RS2-TX. Eight RJ45 ports, 10/100MB, 24VDC power.

B. Provide one spare.

2.11 MAGNETIC TRIP SENSORS

A. Provide magnetic trip sensors on entrances required to be alarmed.

B. Sensors shall remain closed when entrances are closed, and open upon separating. They shall be rated for 24VDC.

2.12 RELAYS

A. Provide relays where necessary or indicated on plans

B. Relays shall be Form C having both normally closed and normally open contacts with proper AC or DC coil as necessary.

C. All relays shall meet NEC Class I, Division II, Groups A, B, C & D for hazardous locations.

2.13 TELEPHONE SERVICE

A. Provide one standard phone jack RJ11 inside building for autodialer communication.

B. Coordinate with Telephone company to install service to control building

2.14 SPARES

A. Contractor shall furnish various spare parts as required in the drawings and specifications. For example, Contractor shall furnish:

1. One of each of the different types of floats used in the project.
2. Two of each of the different types of relays.
3. Twelve spares of each of the different types of terminal blocks
4. Four of each type and color of indicator lamp bulbs
5. Six spares of each of the different types of fuses
6. Four spares of each type of luminaire lamp used
7. Ethernet switch

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install per manufacturer's recommendations and instructions.

B. Installation shall be performed in the arrangement and position as shown on the drawings.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Cost for items specified in this section shall be included as a portion of the lump sum price for the project for Electrical as indicated on the Bid Form. No separate measurement for these quantities will occur.

2. Payment and installation for Telephone service shall be provided by Contractor. Contractor shall arrange for transfer of service into City's account.

END OF SECTION

SECTION 16500 – LIGHTING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work consists of providing a complete lighting system as specified herein and shown on the drawings.

1.02 SUBMITTALS

A. Fixture construction details, photometric data, and ballast type shall be supplied as part of the submittal procedure.

1.03 QUALITY ASSURANCE

A. The Contractor shall test all lighting installations and demonstrate satisfactory operation of switching controls upon completion of the installation. The Contractor shall replace all defective lamps and/or ballasts prior to occupancy by the Owner. All fixtures shall be cleaned and visible labels removed.

B. Fluorescent lamps and ballast shall be designed to work together as a system. Shall be OSRAM-Sylvania or approved equal.

PART 2 PRODUCTS

2.01 FIXTURES

A. The Contractor shall be responsible for the complete equipment of all fixture types called for. All standard fixtures shall be approved by UL and shall have UL inspecting labels attached thereto. Fixtures shall be grounded in accordance with the NEC.

1. Interior Control Building – 4 lamp, T-8, fluorescent fixtures

2. Outdoors– Down facing HID Lighting

2.02 INTERIOR FLUORESCENT LIGHTS

A. BALLASTS --Cooper Lighting Metalux High Efficiency Systems with WS-432A EB-8 Energy Saving ballasts with less than 10% THD. CBM/ETL Class P with UL/CUL listing, suitable for damp locations.

B. LAMPS – Sylvania Octron 32 Watt 48" T-8 Extended Performance Ecologic Fluorescent or approved equal.

C. MATERIALS – Metal parts shall be die-formed from code gauge steel. Ballast cover to be removed without tools. Diffuser shall be 100% acrylic. No asbestos shall be used in this product. Diffuser shall be wraparound style.

D. FINISH – Painted parts shall be finished with high-gloss, baked white enamel.

E. LISTING – Fixtures shall be UL listed and labeled.

F. FIXTURE – Shall be Model WS-432A-120V-EB81-U from Cooper Lighting; or approved equal.

2.03 EXTERIOR AREA LIGHTING – DOOR ENTRY LIGHT

A. CONSTRUCTION – Die-cast aluminum housing meeting NEMA specifications and dimension standards. Wall mounted. Cut off visor to minimize light spread.

B. ELECTRICAL – 277V, 250 Watt.

C. OPTICAL SYSTEMS – Thermal and shock resistant tempered glass with aluminum reflector.

D. LAMPS – High Pressure Sodium, 250W

E. LISTING – UL listed for wet locations.

F. FIXTURE – TWR2C as manufactured by Lithonia Lighting; or equal.

2.04 ACCESSORIES

A. Fixtures shall be furnished complete with all lenses, trims, hangers, nipples and extensions necessary for a complete installation. All light diffusing media shall be free of scratches or cracks. In general, diffusers shall be of acrylic material unless otherwise noted.

PART 3 EXECUTION

3.01 INSTALLATION

A. Supports

1. All supports for fixtures shall be furnished. All stem lengths shall be adjusted to meet conditions. Mounting heights to bottom of fixtures are given as accurately as possible and shall be adjusted to conform to job conditions.

2. Clean all fixture lenses prior to final acceptance.

B. Grounding

1. Lighting systems shall be securely grounded. For rigid conduit, a threaded hub or double locknut and bushing connection shall be considered adequate. For systems employing flexible conduit feeds, a green insulated No.12 AWG solid wire shall be run with the phase conductors, and bonded to the box and fixture at each end of the flexible conduit. The ground connection shall be accomplished by means of cadmium plated round head machine screws, lockwasher and nut.

C. Coordination

1. The Contractor shall provide adequate fixture attachment to ceiling members in accordance with NEC. The Contractor shall inspect the mechanical plans and the actual site to verify that no interferences occur with diffusers, grilles or duct work or piping.

PART 4 SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

SECTION 16740 – ETHERNET NETWORK

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Provide all cables, conduit, junction boxes, routers, switches, hubs, patch cables, and appurtenances as required for the network system.

B. Provide the network as shown on the drawings.

PART 2 - PRODUCTS

2.01 DETAILS

A. All wiring and connectors shall be to Category 5e standards.

B. Cables, 10/100BaseT: Provide all ethernet cables needed to network a computer.

C. Receptacles shall be modular 10Base-T style. Cables shall be Category 5e. All components of the network shall be approved for Category 5e Ethernet Network use.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Permanent network routing, such as between PLC and Transfer Switch, shall be to Category 5e specifications and shall be contained in raceway and terminated in permanently mounted panels.

PART 4 - SPECIAL PROVISIONS

4.01 MEASUREMENT AND PAYMENT

A. Schedule I – Pump Station No. 4 Replacement

1. Costs for all items in this Section shall be included within the lump sum price for Electrical Improvements Complete as stated in the Bid Form. No additional payment will be made for this item.

END OF SECTION

DIVISION 17- OPERATION
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SECTION 17500 – OPERATIONAL AND ALARM STRATEGY

PART 1 PURPOSE

1.01 PURPOSE

A. The purpose of this Section is to provide a description of the operating and control strategy for Pump Station 4.

B. The pump station will be equipped with two pumps, one pumps running will be capable of delivering at least 700 gpm at 57 feet total dynamic head.

PART 2 SYSTEM DESCRIPTION AND OPERATING STRATEGY

2.01 SYSTEM DESCRIPTION

A. Operational strategy of the pump station is based on a maximum wastewater level in the wetwell of 7 feet (relative to the bottom of the wetwell) which corresponds to a level approximately 4 inches above the influent pipe invert. This level corresponds to the high water alarm level of -1 feet (see sheet M2). The minimum water level in the wetwell is 2 feet above the bottom of the wetwell. This minimum level corresponds to the pumps off elevation of -8 feet.

2.02 OPERATING STRATEGY

A. When the water level in the wetwell reaches 5.65 feet (-2.35 feet elevation), the lead pump will start at an initial pumping rate of 500± gpm to provide a flushing velocity of 3.5 ft/sec in the forcemain. This velocity will be maintained until the pumps off level of -6 feet elevation is reached, which corresponds to approximately 4.35-feet of draw-down in the wetwell.

B. If the water level in the wetwell drops after the initial flushing rate of 500 gpm, then the pumping rate shall be ramped down to a minimum pumping rate of 280 gpm, corresponding to the minimum allowable forcemain velocity. The pump shall continue pumping at 280 gpm until the water drops to the pump shut off elevation of -6 feet.

C. If, after the lead pump starts at the initial flushing rate of 500 gpm, the water level continues to rise, the pump shall ramp up the maximum velocity of 700 gpm. The pump shall continue at the higher velocity until the level drops below the initial start point and begin to ramp down until the wetwell reaches the pump shut off elevation.

D. As the water level drops in the wetwell, the pumping rate shall be ramped down prior to reaching the pump shut off elevation to avoid a sudden shut down and corresponding water hammer.

E. If the water level in the wetwell rises to 6.5 feet (-1.5 feet elevation), a manual float shall be triggered which bypasses the controller and turns the pump one VFD on at maximum speed. The pump shall remain on until the wetwell shut off elevation is reached and triggers a backup shut off float.

F. If the water level in the wetwell rises to 7 feet, (-1 foot elevation), a manual float shall trigger the high water alarm and turn the pump two VFD on at maximum speed. Both pump one and pump two shall remain on at maximum speed until the wetwell shut off elevation is reached and triggers a backup shut off float.

G. If the water level in the wetwell drops to 1.5 feet (-6.5 foot elevation), a manual float shall disable all VFD's, controls to pumps and signal a low water level alarm on the dialer. The pumps shall remain disabled until the alarm stops or is overridden manually by the user.

H. If the water level in the wetwell has signaled a low water level alarm and concurrently signals a pump one bypass elevation of 1.5 feet, the pumps shall remain off from the low water level alarm.

I. If the water level in the wetwell has signaled a low level water alarm and concurrently signals both a pump one bypass and high level alarm pump two bypass, the pumps shall override the low water alarm and separately engage the motor drives to each pump until the high water alarm ceases.

J. At least once per 7 day period the pump station shall maintain at least 550 gpm flow for a minimum of 3 minutes to completely flush the forcemain. This process will prevent solids build-up in the forcemain. During summer months when system flows are low, the wetwell shall be allowed to fill during the night to 0 feet elevation to provide a total volume of 1,700 gallons, which is sufficient to flush the forcemain.

PART 3 CONTROLS AND ALARMS

2.01 CONTROLS

A. Pump controls will include variable frequency drives (VFDs) for each pump.

B. All of the pumps will be governed by a single pump control unit. Pump control unit shall be as specified in Division 16.

C. The control unit will integrate inputs from level sensor(s), float switches and flow meter along with outputs to the VFDs.

D. The control unit will alternate each of the two pumps as lead pumps so as to keep the total running hours on each pump approximately equal.

E. Pump start and stop functions will be based on a continuous signal from the level transmitter.

F. If the high level float switch is activated, the pump controller shall ramp up pumps to maximum capacity and the high level alarm shall be activated.

G. If the pump off switch is activated, the pump controller shall ramp down the pumps to zero. If the low level alarm switch is activated then pumping shall stop immediately and the low level alarm shall be activated.

H. Each pump shall be equipped with a mechanical hour meter located on the drive panel. The meter shall increment from a VFD signal whenever the pump is operated. Each meter shall be clearly and permanently labeled.

I. Each pump shall have an H-O-A switch on the panel. Each switch shall be clearly and permanently labeled. The operation in each mode shall be as follows:

1. H – Hand: In hand operation the pumps will run manually.
2. O – Off: Turns off the pump.
3. A – Auto: Pumps run in automatic mode and start when the controller energizes the VFDs. The controller will follow the strategy as outlined below.

J. Each pump shall have an Bypass/Test/Run switch on the panel. Each switch shall be clearly and permanently labeled. The operation in each mode shall be as follows:

1. Bypass: VFD controls are bypasses and the pumps will run at full speed controlled by the PLC
2. Test: Used for function testing and troubleshooting
3. Run – Auto: Pumps run in normal mode and start when the controller energizes the VFDs. The controller will follow the strategy as outlined below.

2.02 CONTROL STRATEGY

A. One pump will be required to meet the pumping requirement of 500 gpm. The pump should start at approximately 66% speed (40 Hz) and ramp up to the speed required to produce the desired flow rate within approximately 15 to 20 seconds.

B. Peak design capacity will be met with a single pump. When greater flow occurs, it should the pump shall quickly ramp up to maximum speed.

C. During periods of low flow the initial pumping rate of 500 gpm shall be maintained for approximately one minute and then ramped down to the minimum flow rate of 280 gpm.

D. Flushing cycle shall occur at least once per 7 day period. Flush cycle shall occur at night to avoid odor complaints. Minimum flow during flush cycle shall be 550 gpm. Higher flows are acceptable. Minimum flush volume shall be 1,700 gallons, larger volume flush is acceptable. Pumps shall quickly ramp up to required speed and quickly ramp down at the end of the cycle. Flow and run time shall be sufficient to move a full 1,700 gallons at a flow meeting or exceeding the specified flush flow of 550 gpm.

1. Flushing cycle will override emergency floats using the PLC output during fill cycle.

2.03 ALARMS

A. System alarms will include:

1. High wet well level (float switch)
2. Low wet well level (float switch)
3. Pump One float override alarm (float switch)
4. Pump motor moisture (integral pump moisture sensor)
5. Pump over temperature (integral pump temperature sensor)
6. Power loss, phase loss (automatic transfer switch)
7. Door security alarm
8. Wetwell security alarm
9. Smoke detector
10. VFD Failure
11. Pump Fail to Start/Stop
12. PLC Fault
13. UPS Trouble/Failure
14. Flowmeter Vault Flooding
15. Level Sensor Failure
16. Generator Excessive Runtime
17. Additional Generator Alarms
18. Overflow Alarm
19. Check Valve Fail to Open/Close

2.04 CONTROL / ALARM SUMMARY

Point Description	Level Above Bottom of Wetwell	Water Surface Elevation (ft)	Time Delay
Low Level Alarm	1.5 ft	-6.5	n/a
Pumps Off	2.0 ft	-6.0	n/a
Pump On	5.65 ft	-2.35	n/a
Emergency Pump On	6.5 ft	-1.5	n/a
High Level Alarm	7 ft	-1.0	n/a
Overflow Alarm	15.75 ft	7.75	n/a

PART 3 EXECUTION

3.01 FIELD ADJUSTMENT

A. Engineer and other City representatives at the City's option shall be present during start up and testing. Changes and adjustments to operational strategy and level alarms will be allowed during start-up and testing as directed by the Engineer.

END OF SECTION

City of Coos Bay

Coos County, Oregon

CONTRACT DOCUMENTS

VOLUME 3 – Project Drawings

FOR THE CONSTRUCTION OF

Pump Station No. 4

SCHEDULE I: Pump Station No. 4 Replacement

SCHEDULE II: New Gravity Sewer Line and Force Main

August, 2011

City Project No. 09/10-002

Engineers Project No.1201-022

Civil West Engineering Services, Inc.

Prepared By:

Civil West Engineering Services, Inc.

486 E Street • Coos Bay, Oregon 97420 • Ph. 541.266.8601, Fax 541.266.8681 • www.civilwest.com

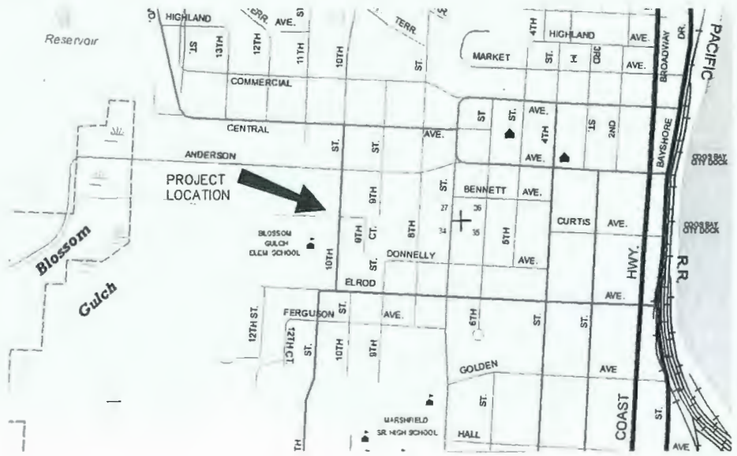
CITY OF COOS BAY

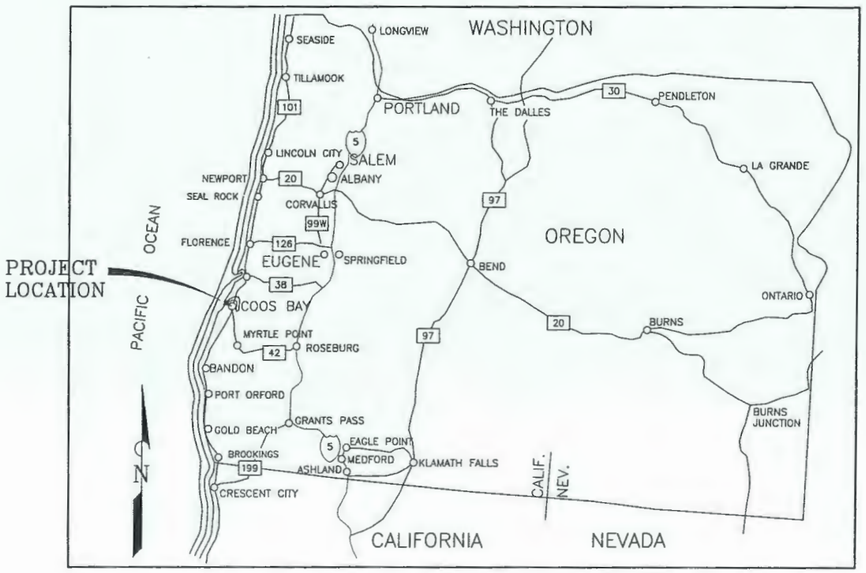
COOS COUNTY, OREGON

PUMP STATION 4 REPLACEMENT

CITY PROJECT NO.: 0910 002

2011





PAGE NUMBER	SHEET	SHEET TITLE
01	C0	COVER
02	C1	LEGEND & P&ID
03	C2	SITE PLAN EXPANDED AREA
04	C3	SITE FACILITIES PLAN
05	C4	DEMOLITION PLAN
06	C5	SITE GRADING
07	M1	WETWELL & VAULT ELEVATION
08	M2	HEADER & FLOWMETER
09	M3	WETWELL TOP
10	M4	WETWELL BASE
11	M5	GRAVITY MAIN PLAN & PROFILE
12	M6	FORCE MAIN PLAN & PROFILE
13	S1	BUILDING ELEVATIONS
14	S2	BUILDING SECTION
15	S3	STRUCTURE DETAILS
16	S4	STRUCTURE DETAILS CONTINUED
17	S5	RETAINING WALL
18	D1	STANDARD DETAILS TRENCHING
19	D2	STANDARD DETAILS MANHOLES
20	D3	BACKFLOW PREVENTER DETAILS
21	D4	STANDARD DETAILS MANHOLE BASE AND COVER
22	D5	STANDARD DETAILS CUT OFF WALL/WETWELL SENSOR TREE
23	D6	STANDARD DETAILS WETWELL PANEL/AIR RELEASE VALVE
24	E1	ONE-LINE DIAGRAM
25	E2	ELECTRICAL CONDUIT
26	E3	ELECTRICAL CONTROLS CONDUIT
27	E4	ELECTRICAL DISTRIBUTION PANELS
28	E5	CONTROLS SCHEMATIC

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OREGON
JULY 9, 2007
JAMES G. PALLO
EXPIRATION DATE: 12/31/12

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Designed By: JBH
Drawn By: JBH
Checked By: JGP
File: BASE MAP
Project No: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

TITLE SHEET

Sheet No: C0
Date: 5/29/2011
1 of 28

WATERLINE
STORM SEWER
NEW FORCE MAIN
NEW SANITARY SEWER
NEW FENCE
RIGHT OF WAY BORDER
TEMPORARY CONSTRUCTION EASEMENT
PERMANENT UTILITY EASEMENT
EXISTING RETAINING WALL
NEW RETAINING WALL
EXISTING FORCE MAIN
EXISTING SANITARY SEWER
STREAM
CONTOUR INTERVAL
GRAVEL ROAD EDGE
NEW ELECTRIC UTILITY

GRANULAR CRUSHED ROCK MATERIAL
DRAIN ROCK
WOOD
ASPHALT OR CONCRETE
NATIVE OR SUITABLE FILL DIRT
SAND OR FINE CEMENTIOUS MATERIAL

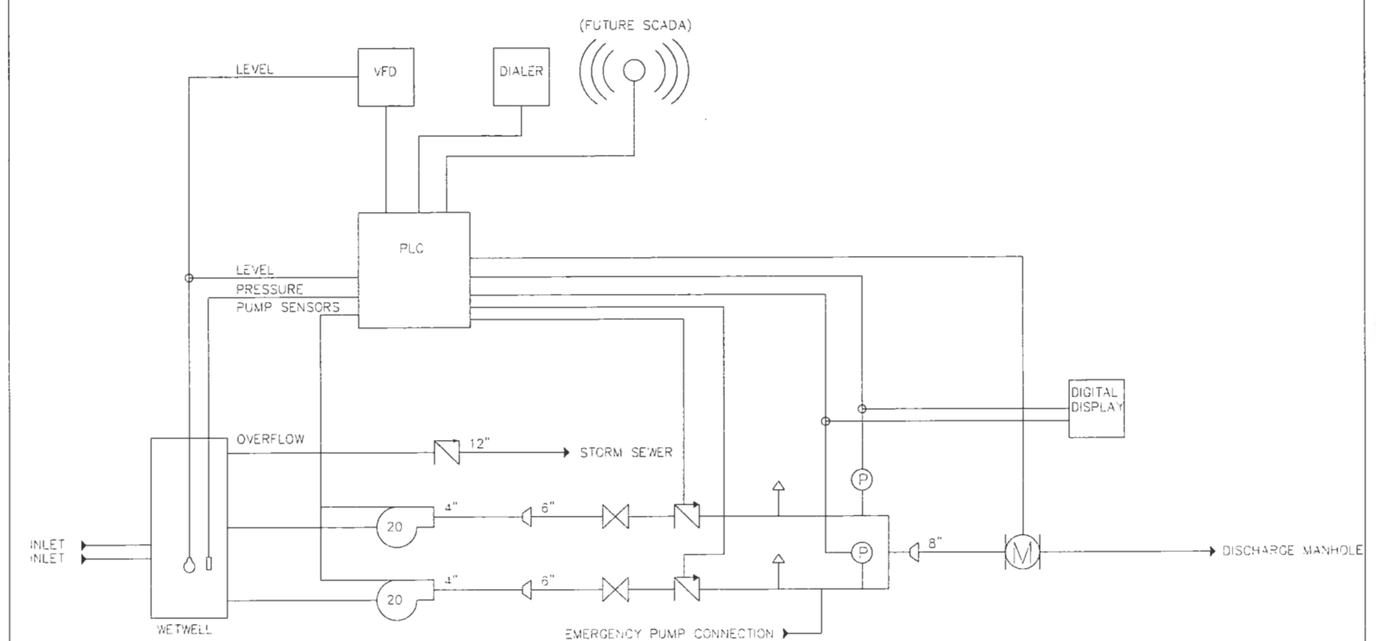
DETAIL REFERENCE NUMBER
DETAIL NAME
1 / M1 DETAIL
SCALE: 1" = X"
SCALE (IF USED)
DRAWING PAGE DETAIL NUMBER

NOTES:
ELEVATIONS IN THIS DRAWING ARE USING MLLW DATUM FROM SURVEY.

CITY OF COOS BAY BENCHMARK AT SW CORNER OF ANDERSON AND 10TH ST. PUBLISHED ELEVATION = 24.51, ADJUSTED ELEVATION USED = 24.96

ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through 952-0010090. You may obtain copies of the rules by calling the center. (note the telephone number for the Oregon Utility Notification Center is (503) 232-1987).

EXISTING AC SURFACE
EXISTING MANHOLE
W-2
EXISTING BUILDING
NEW MANHOLE
WM EXISTING WATER SERVICE CONNECTION
MECHANICAL SWITCH OR DRY CONTACT
FLOWMETER
NORMALLY OPEN RELAY
20 PUMP (20HP)
NORMALLY CLOSED RELAY
CHECK VALVE
DIAMETER INCREASE
NC FLOAT SWITCH (NORMALLY CLOSED)
VALVE
P PRESSURE GAGE
DUPLEX RECEPTACLE
P'O RELAY COIL LEG
2-WAY SWITCH



1 / C1 PROCESS & INSTRUMENTATION DIAGRAM

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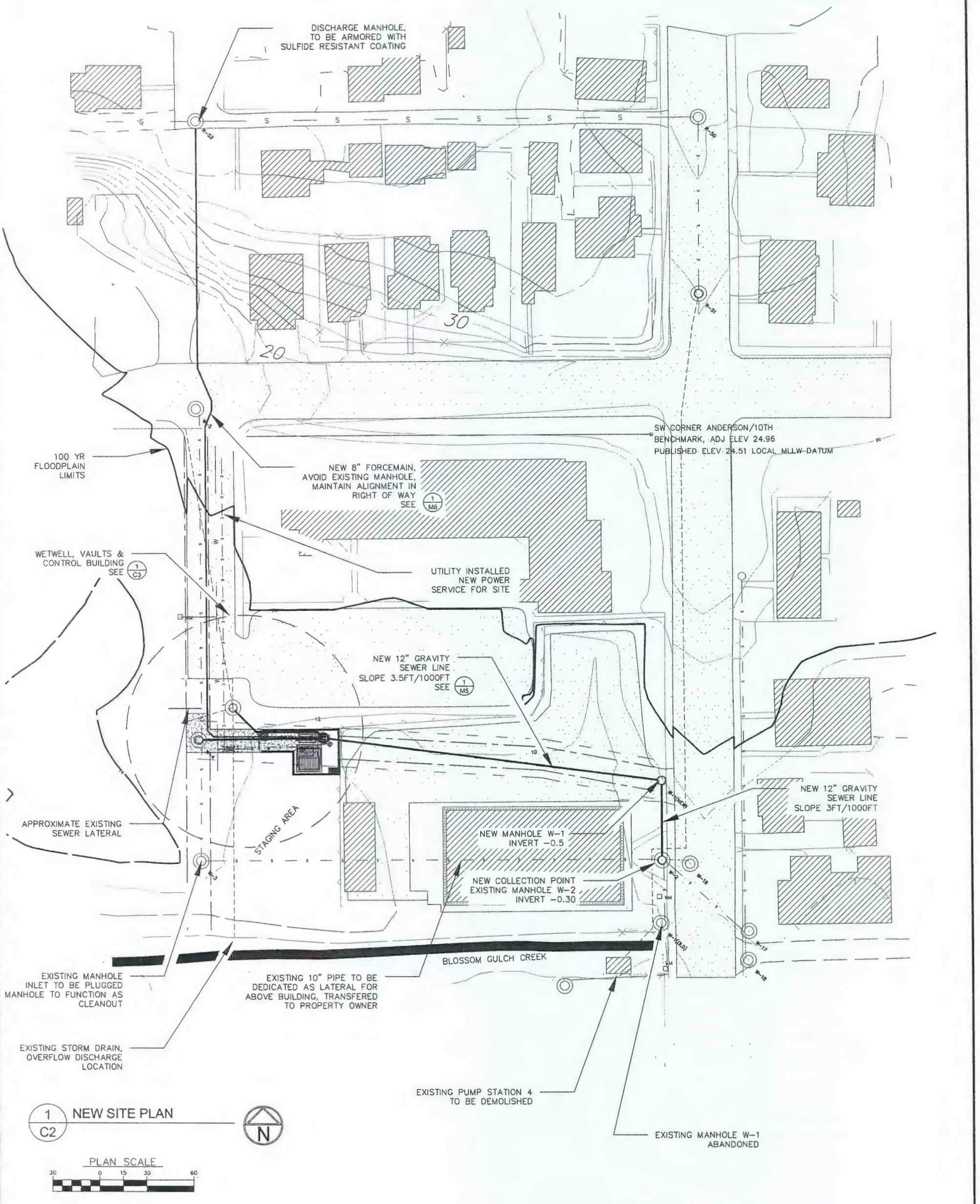
CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

LEGEND + P+ID

Sheet No. C1
Date 5/29/2011
2 OF 28



1/C2 NEW SITE PLAN

N

PLAN SCALE

30 0 15 30 60

Date	5/29/2011
Sheet No	C2
	3 OF 28

CITY OF COOS BAY
500 CENTRAL AVE

PUMP STATION NO. 4
REPLACEMENT

SITE PLAN EXPANDED AREA

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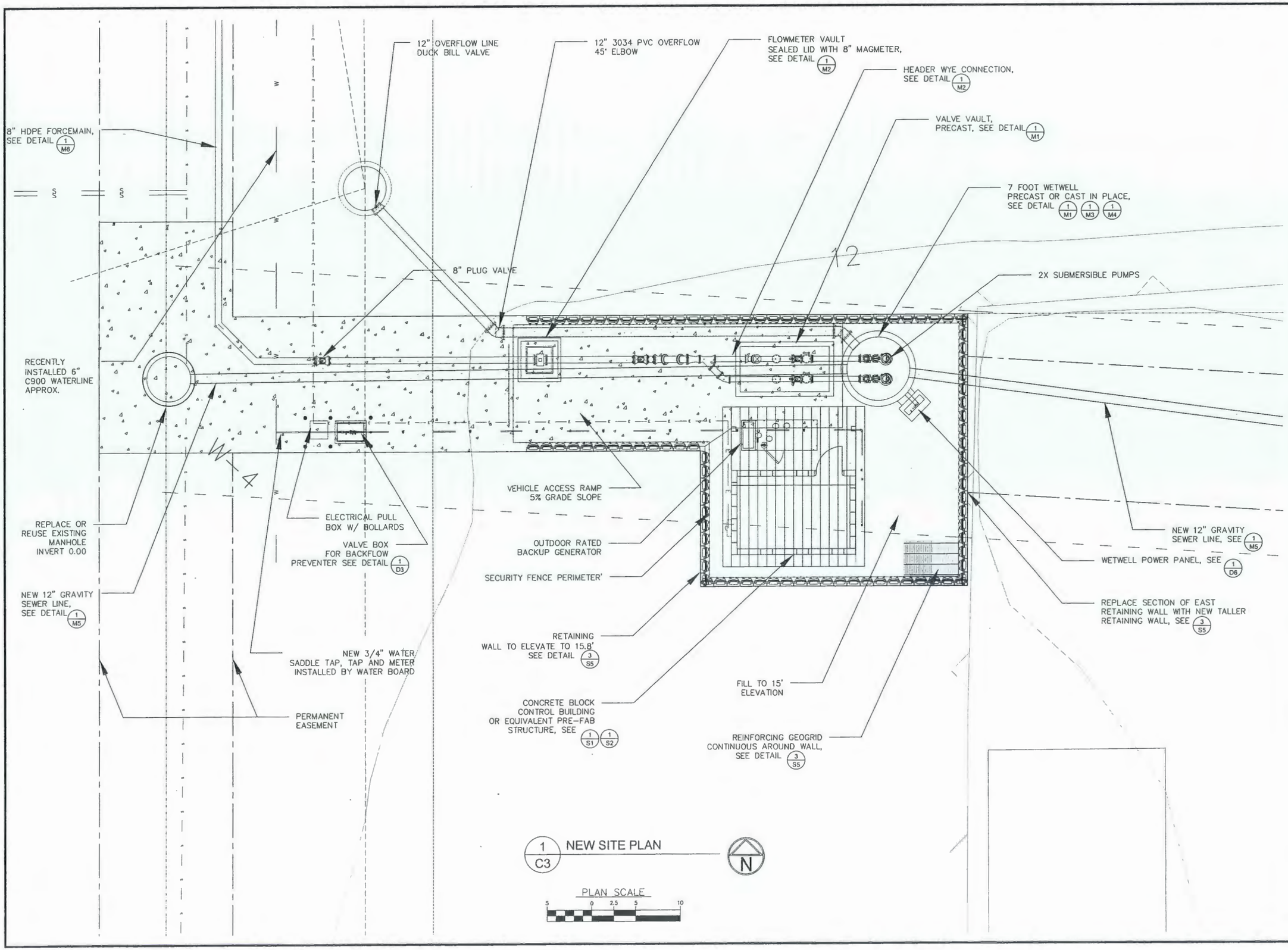

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CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

SITE FACILITIES PLAN

Sheet No: C3
Date: 5/29/2011

1. EXISTING FORCEMAIN, ABANDON AND SLURRY FILL UPON STARTUP OF NEW PUMP STATION
2. EXISTING 16" DISCHARGE, PERMANENTLY PLUG
3. 16" PIPE, ABANDON AND SLURRY FILL AT COMPLETION
4. EXISTING MANHOLE, FILL AND PLUG INLET, OUTLET TO BECOME CLEANOUT ACCESS
5. WEST INFLUENT PIPE LOCATED BENEATH EXISTING STRUCTURE, TRANSFER TO PROPERTY OWNER FOR USE AS A LATERAL
6. TEMPORARY CONSTRUCTION EASEMENT, 30-FEET WIDE
7. PERMANENT UTILITY LINE EASEMENT, 15-FEET WIDE
8. EXISTING RETAINING WALL, REMOVE AND REPLACE WITH NEW SITE RETAINING WALL WITHIN CONSTRUCTION LIMITS PRIOR TO CONSTRUCTION OF PUMP STATION SITE
9. 12" EXISTING SEWER LINE BETWEEN W-3 AND W-4, ABANDON AND SLURRY FILL UPON COMPLETION
10. EXISTING DISCHARGE MANHOLE, PLUG INLET
11. EXISTING PUMP STATION TO BE DEMOLISHED AFTER CONSTRUCTION IS COMPLETE
    - A. PRESERVE CYCLONE FENCING
    - B. REMOVE ALL EXISTING STATION EQUIPMENT AND SCRAP TO CITY
    - C. REMOVE ALL BUILDING STRUCTURE ABOVE SLAB GRADE WHILE PREVENTING ANY DEBRIS OR DISTURBANCE OF CREEK BED AREA OR SALMON HABITAT. BUILDING WALLS AND ROOF SHALL BE DISMANTLED
    - D. SMOOTH SLAB BASE OF DEMOLISHED BUILDING AND SLURRY FILL WETWELL FLUSH WITH CONCRETE SLAB.

PUBLISHED ELEV 24.51 LOCAL ML

AC PAVEMENT

MATCHLINE
FOR CONT. SEE PLAN RIGHT

AC PAVEMENT

W-1(NEW)

W-2

W-18

W-3

W-1(OLD)

W-17

W-18

BYPASS PLUMBING DURING NEW PUMP STATION CONNECTION, IF NECESSARY

BLOSSOM GULCH CREEK

1 / C4 EXISTING SITE AREAS

N

PLAN SCALE
20 0 10 20 40

R-51

10TH STREET

AC PAVEMENT

MATCHLINE
FOR CONT. SEE PLAN LEFT

0.00

2 / C4 EXISTING DISCHARGE

N

PLAN SCALE
20 0 10 20 40

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Project No.: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

DEMOLITION PLAN

Date: 5/29/2011
Sheet No.: C4

REPLACE SECTION OF EAST RETAINING WALL WITH NEW TALLER RETAINING WALL, SEE

12

12

14

15.8

REPLACE SECTION OF EAST RETAINING WALL WITH NEW TALLER RETAINING WALL, SEE (3/S4)

APPROXIMATE MATCH TO EXISTING GRADE, CONFIRM TRANSITION TO ACCESS RAMP DURING CONSTRUCTION

LEVEL NEW RETAINING WALL BASE, MATCH INTERSECTION TO EXISTING

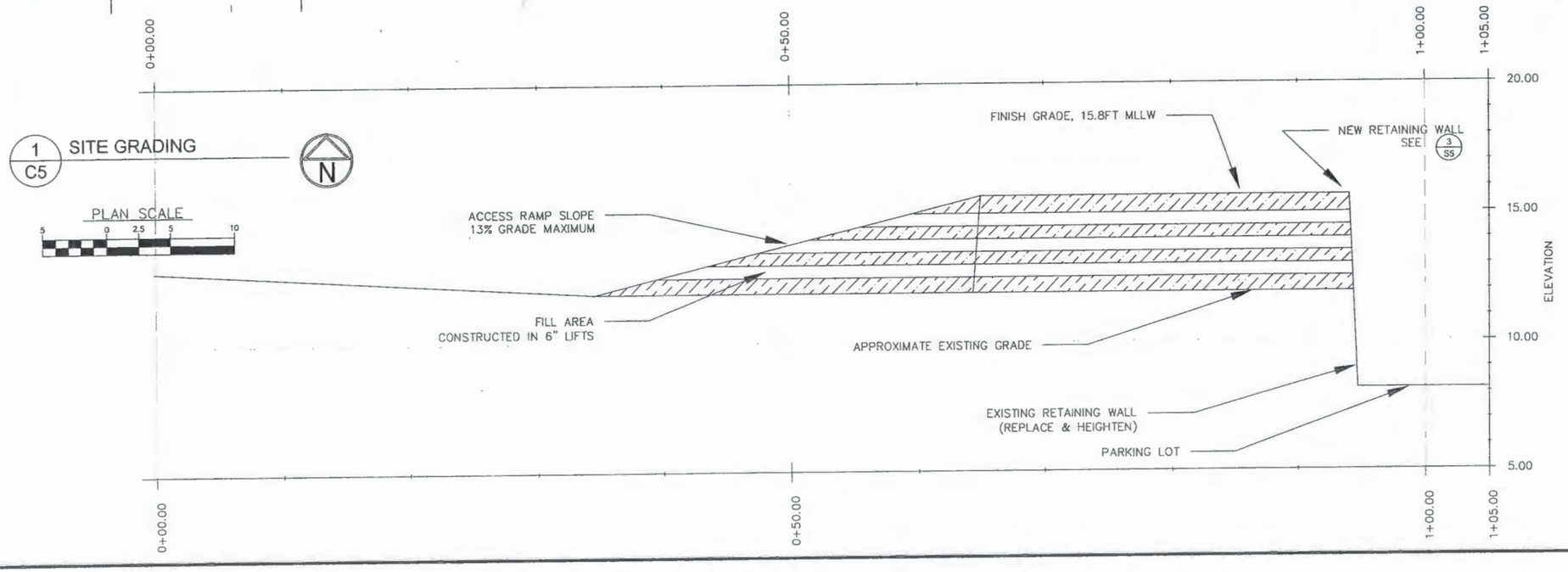
MINIMIZE DISTRUBANCE OF EXISTING SOIL

1 / C5 SITE GRADING

N

PLAN SCALE

5 0 2.5 5 10



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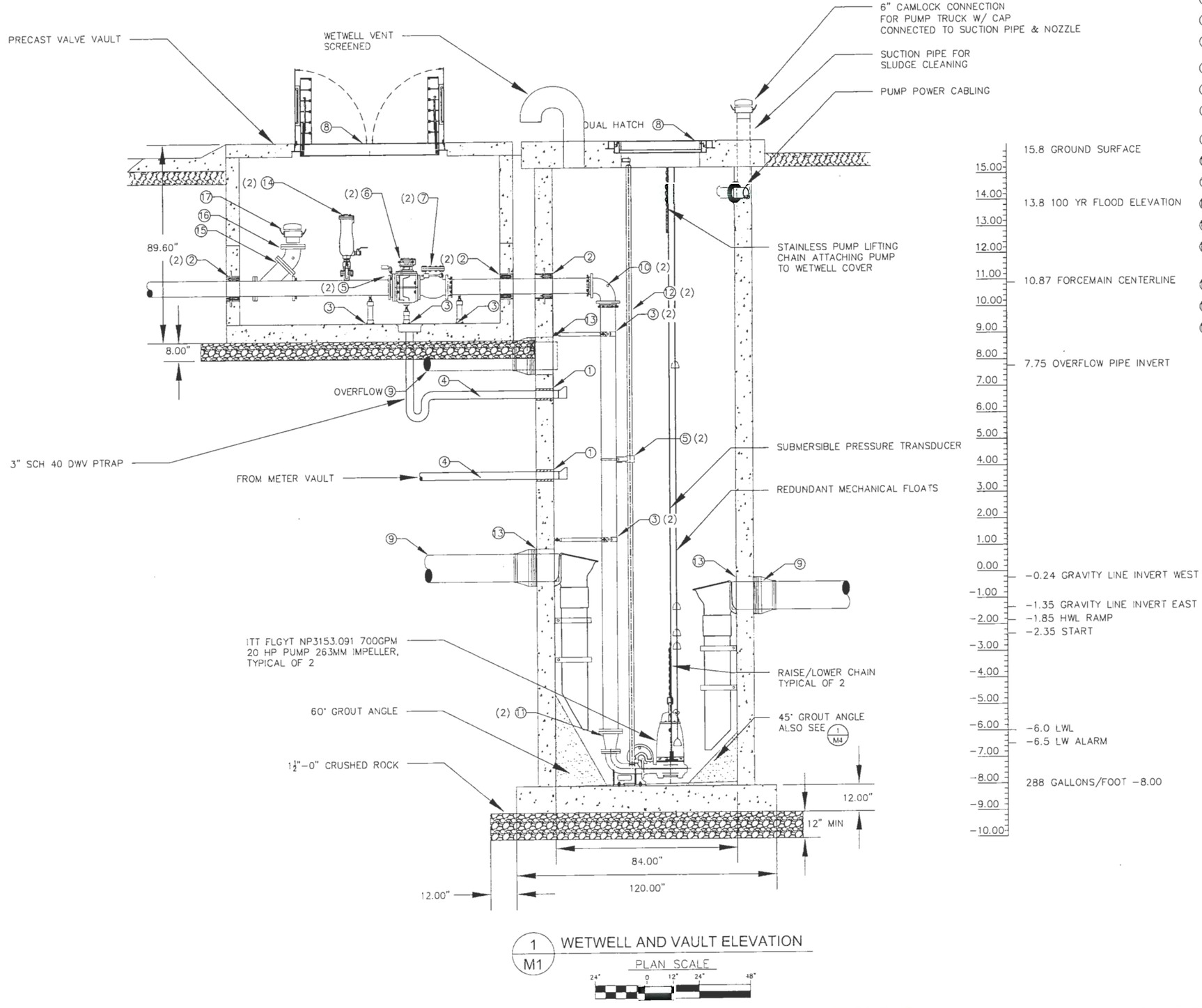
Project No. 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

SITE GRADING

Sheet No. C5
Date 5/29/2011



1 / M1 WETWELL AND VAULT ELEVATION

PLAN SCALE 24" 0 12" 24" 48"

① GROUT PIPE PENETRATIONS
② LINK SEAL PIPE PENETRATIONS
③ PIPE SUPPORT BRACKET
④ 3" SCH 40 DRAIN W/FLAPPER
⑤ HORIZONTAL PRESSURE GAUGE W/ SHUTOFF BALL VALVE
⑥ 6" PLUG VALVE
⑦ 6" SWING CHECK VALVE
⑧ H20 HATCH COVER WITH SAFETY GRATE
⑨ 12" PVC 3034 SEWER PIPE
⑩ 6" FLANGED 90° ELBOW
⑪ 4" TO 6" REDUCER
⑫ PUMP GUIDE BARS
⑬ KOR–N–SEAL BOOT
⑭ COMBINATION AIR RELEASE VALVE, SEE 2/D6
⑮ 6" WYE FLANGE
⑯ 6" 45° BEND
⑰ 6" CAMLOCK FITTING FOR BYPASS PUMP CONNECTION

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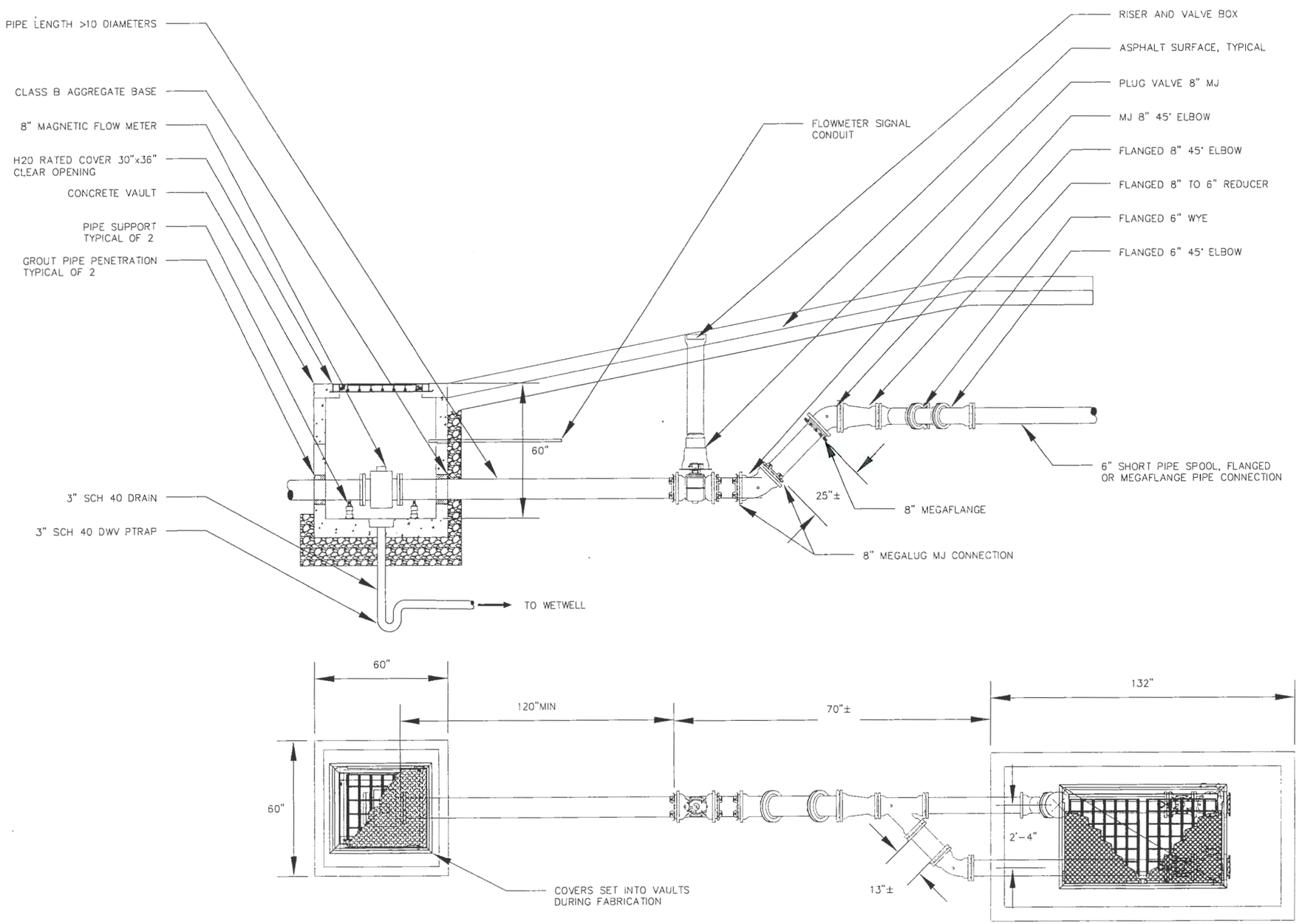
CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

WETWELL + VAULT ELEVATION

Sheet No: M1
Date: 5/29/2011
7 of 28



1 / M2 HEADER & FLOWMETER

PLAN SCALE

24" 0 12" 24" 48"

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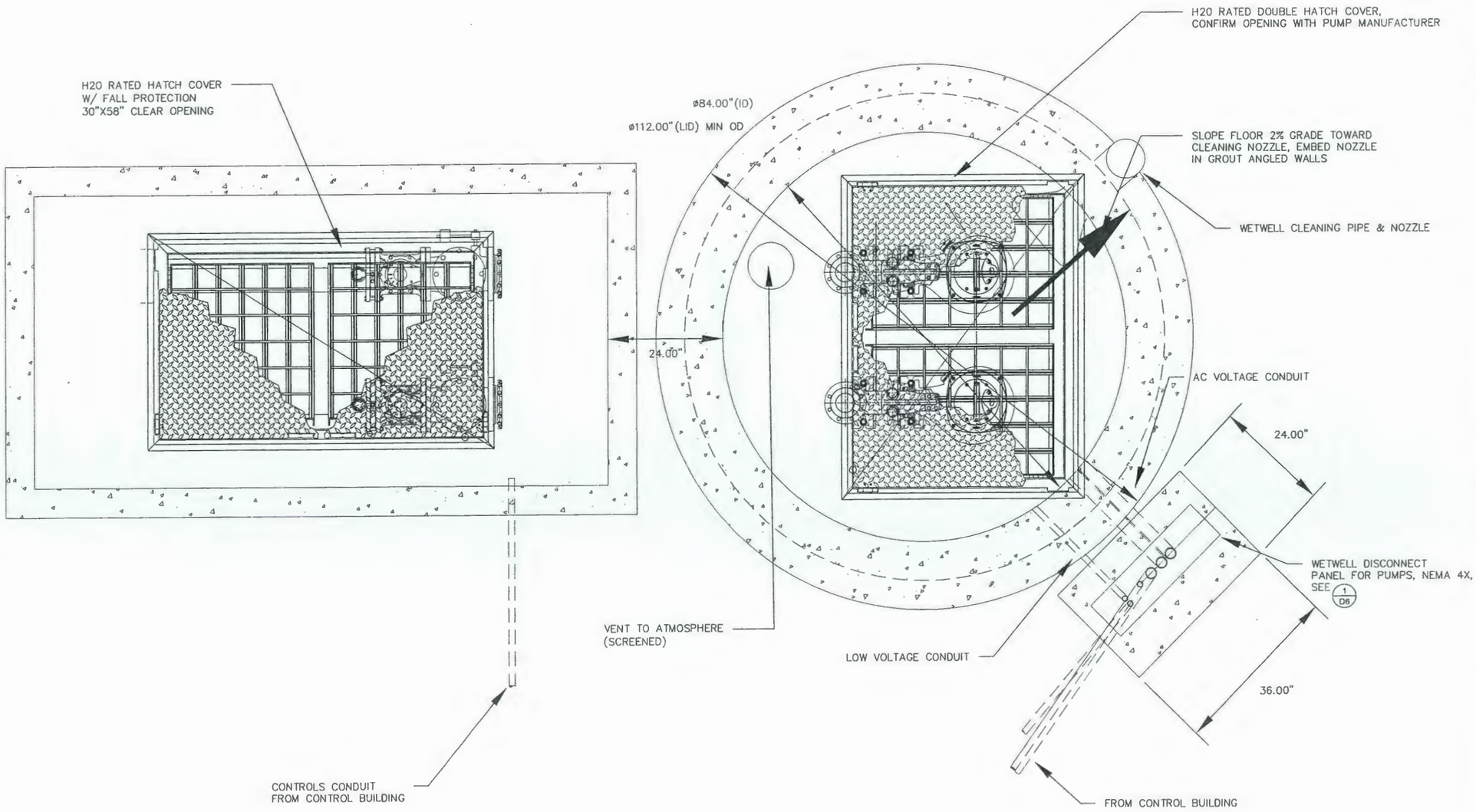
Project No: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

HEADER + FLOWMETER

Sheet No: M2
Date: 5/29/2011



1/M3 WETWELL TOP

PLAN SCALE

12" 0 5" 12" 24"

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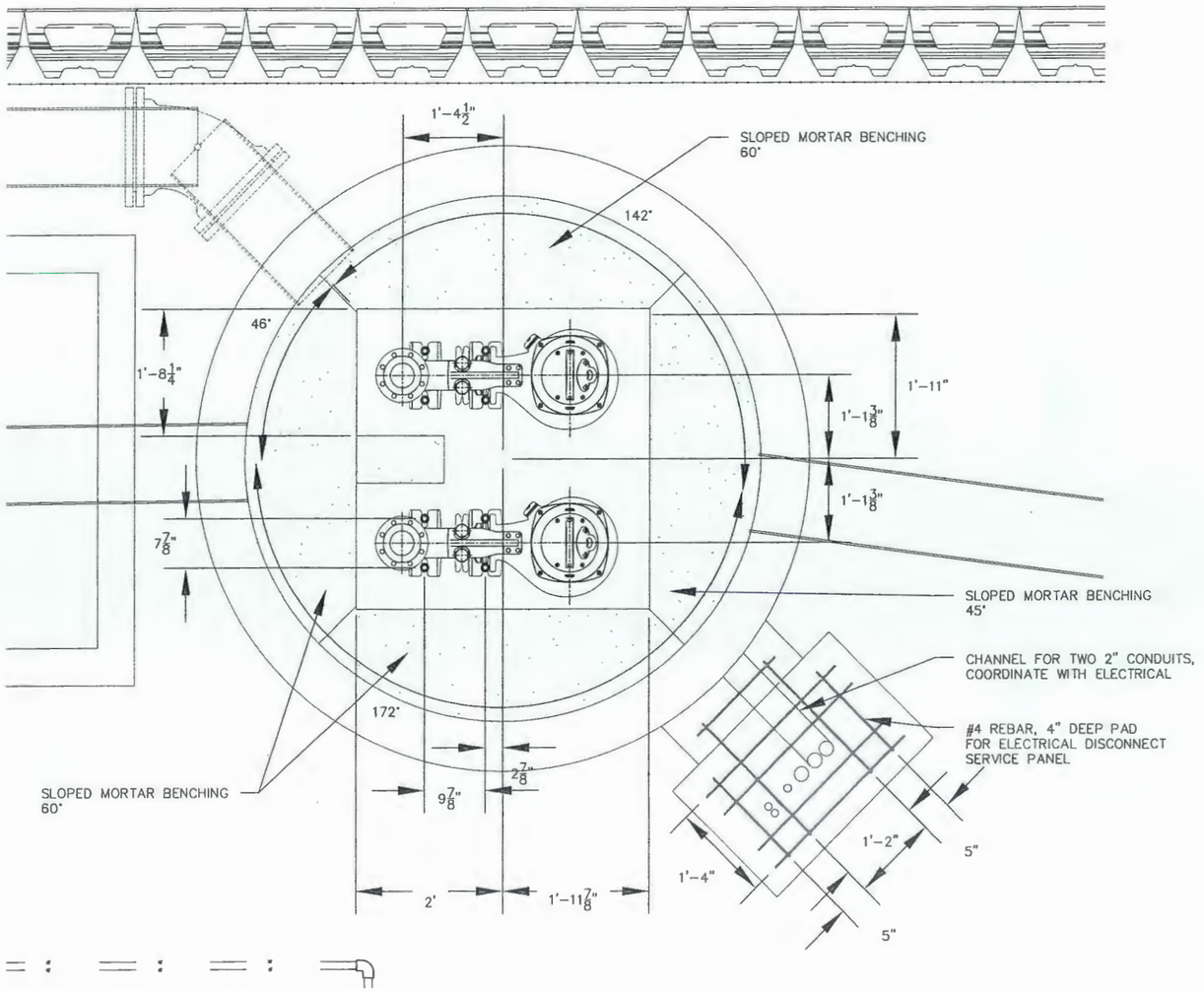
File: PS4 SITEPLAN | Project No: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

REPLACEMENT
PUMP STATION NO. 4

WETWELL TOP

Sheet No: M3
Date: 5/29/2011
9 of 28



1 / M4 WETWELL BASE

PLAN SCALE

12" 0 6" 12" 24"

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OREGON
JULY 9, 2001
JAMES G. PALLO

EXPIRATION DATE: 12/31/12

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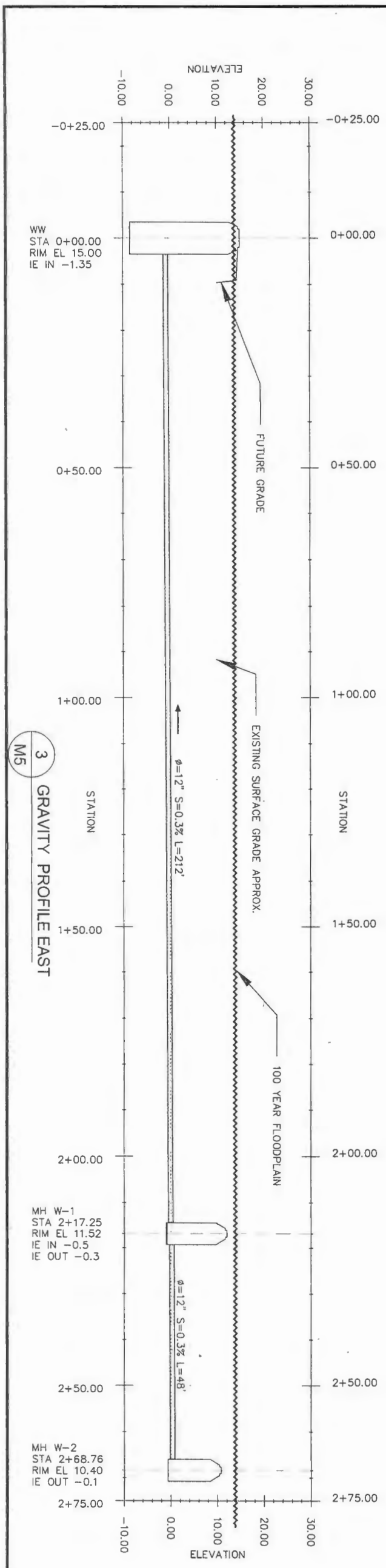
Project No: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

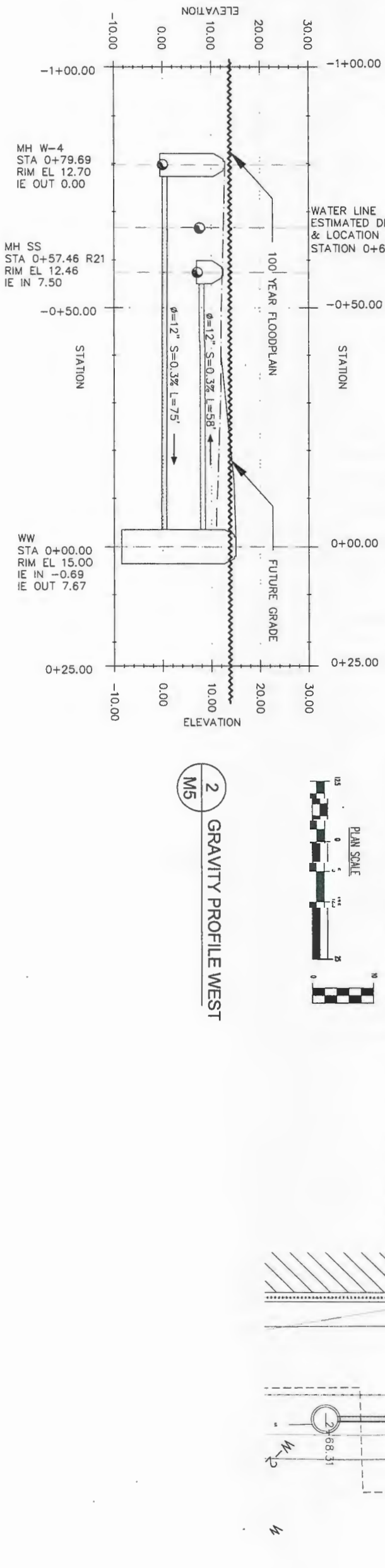
REPLACEMENT
PUMP STATION NO. 4

WETWELL BASE

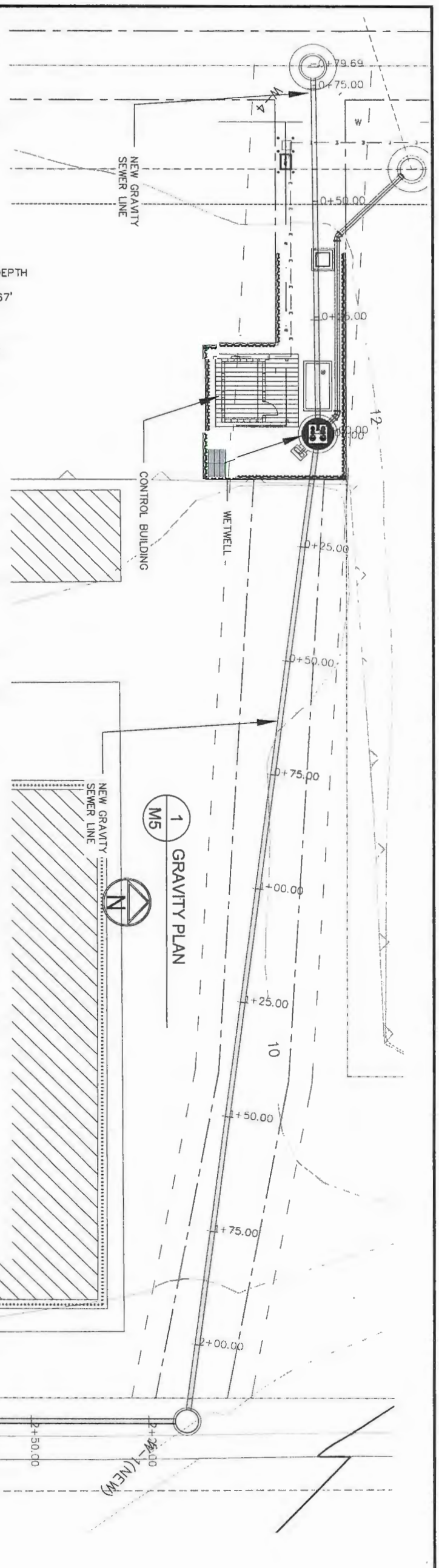
Sheet No. M4
Date 5/29/2011
10 of 28



3 M5 GRAVITY PROFILE EAST



2 M5 GRAVITY PROFILE WEST



1 M5 GRAVITY PLAN

Date	Sheet No.
1/29/2011	M5
11 OF 28	

CITY OF COOS BAY
500 CENTRAL AVENUE

REPLACEMENT
PUMP STATION NO. 4

SCHEDULE II

GRAVITY MAIN PLAN + PROFILE

REV.	DATE	DESCRIPTION	BY

Designed By: JBH | Drawn By: JBH | Checked By: JGP

File: BASE MAP | Project No: 1202-022

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EXPIRATION DATE: 12/31/12

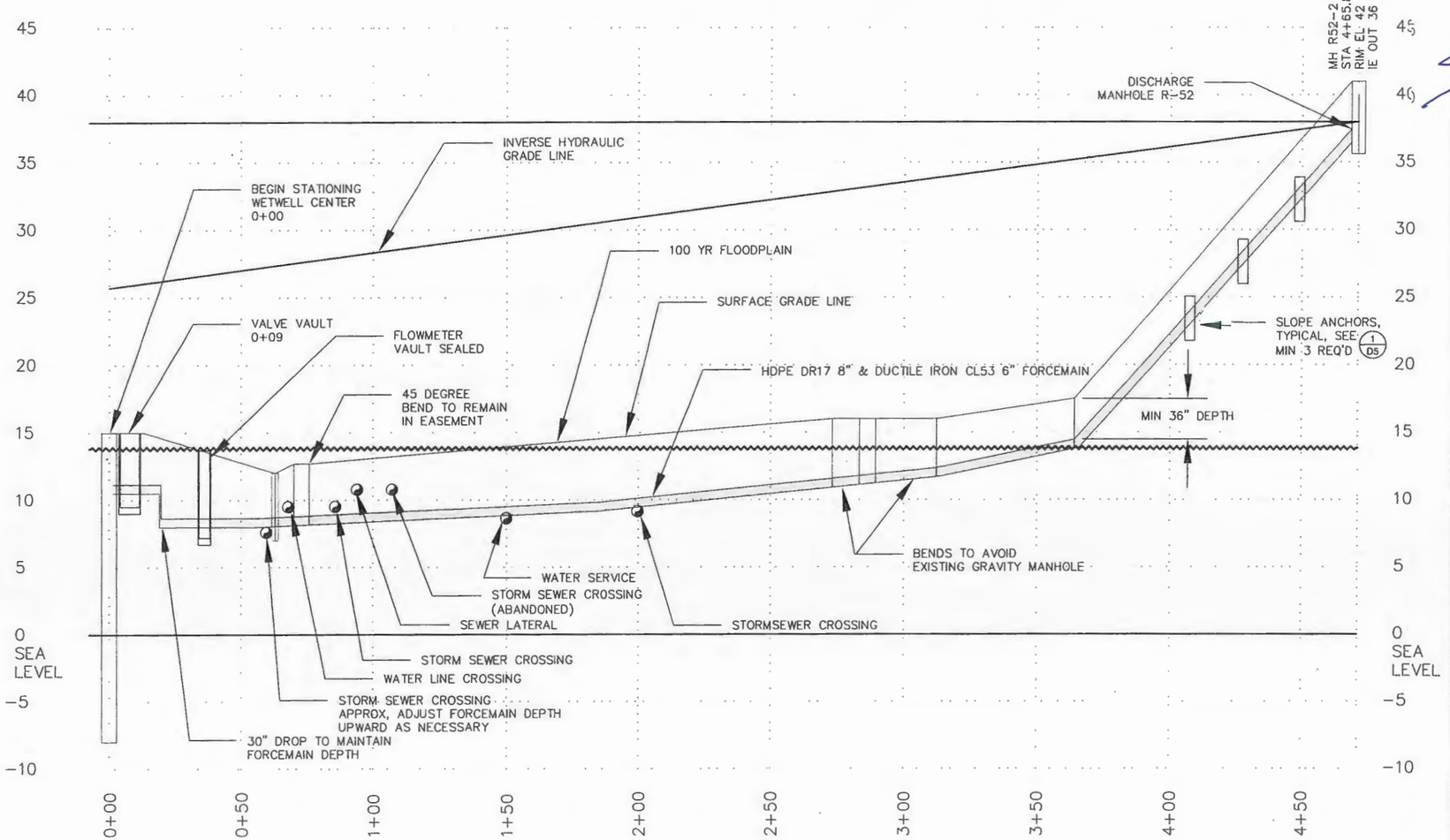
REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 9, 2001
JAMES G. PALO
56560PE
RENEWAL

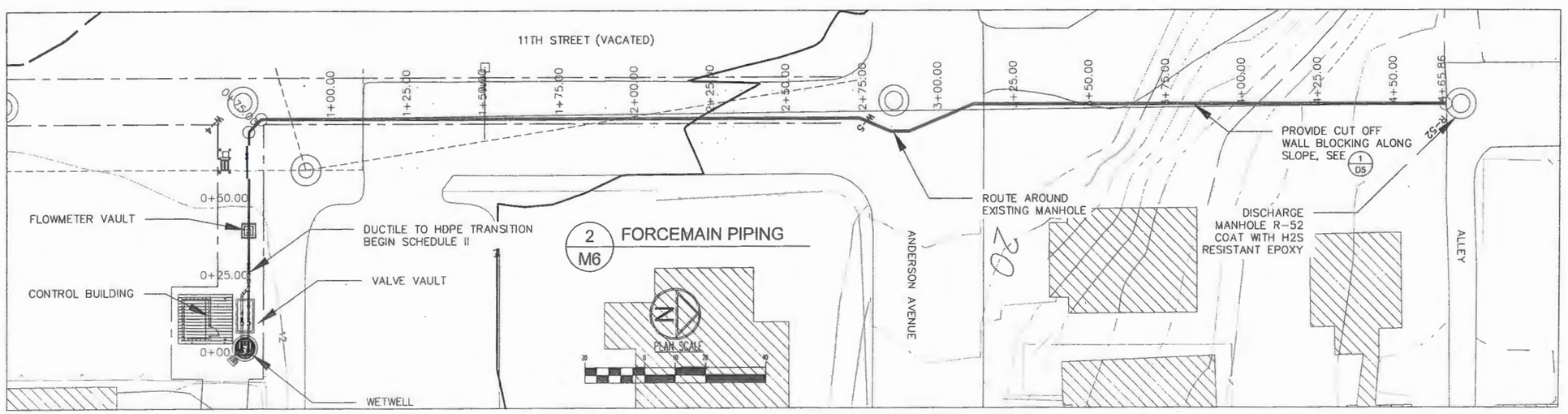
1/M6 FORCEMAIN PROFILE

PLAN SCALE

NOTES:
LOCATIONS AND DEPTH GIVEN FOR UTILITIES ARE A BEST APPROXIMATION AS FOUND IN SURVEY DATA AND CONSTRUCTION PLANS FOR NEARBY APARTMENTS. DEPTHS AND LOCATIONS SHOULD BE VERIFIED BY CONTRACTOR PRIOR TO PLACING PIPE.

ADJUSTMENTS TO FORCEMAIN GRADE MUST MAINTAIN MINIMUM BURIAL DEPTHS OF >36" AND CONTINUOUSLY RISE FROM THE LOWEST POINT TO PREVENT AIR ENTRAPMENT.





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REV.	DATE	DESCRIPTION	BY

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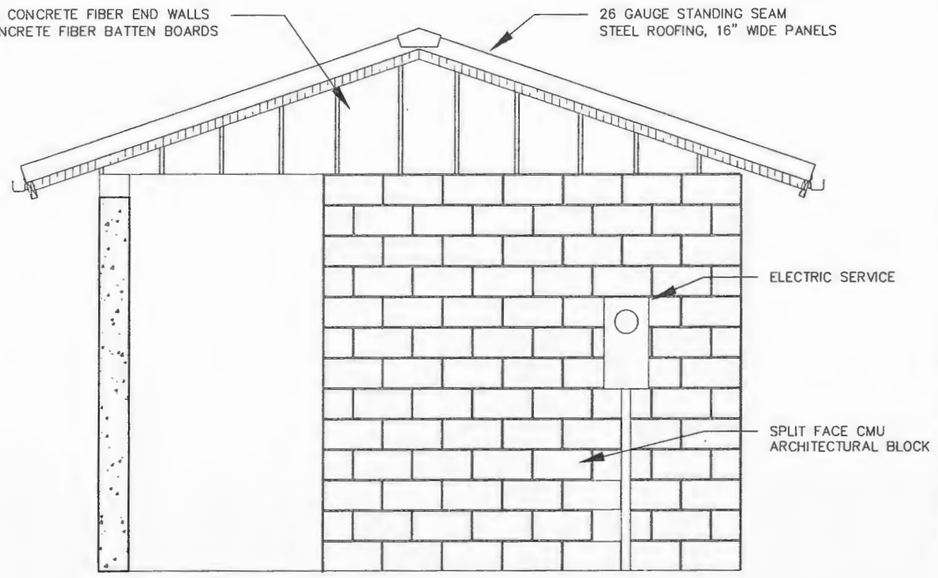
Checked By: JGP
File: PS4 SITEPLAN
Project No: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

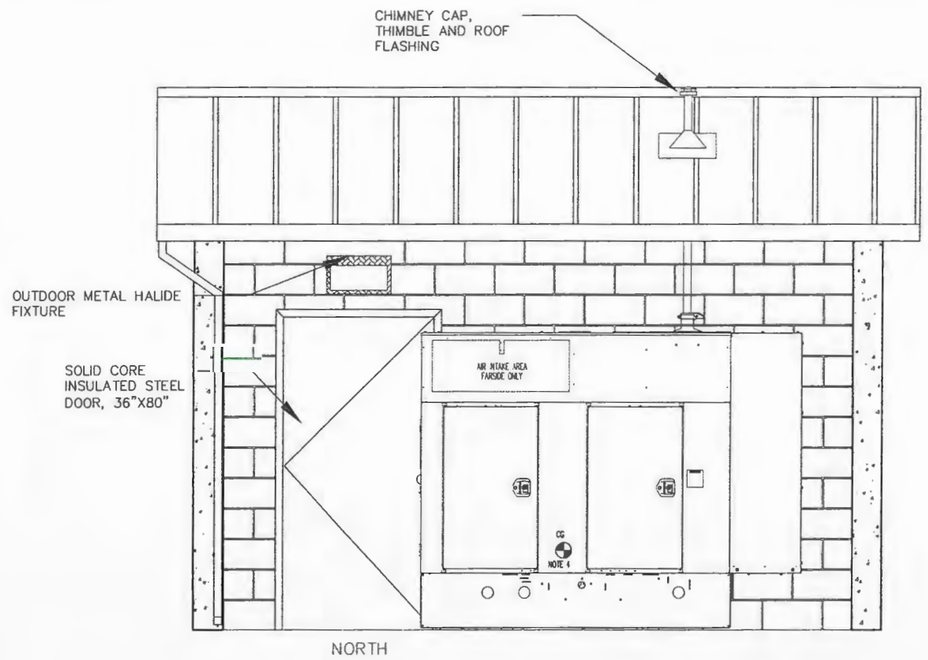
PUMP STATION NO. 4
REPLACEMENT

SCHEDULE II
FORCEMAIN PLAN + PROFILE

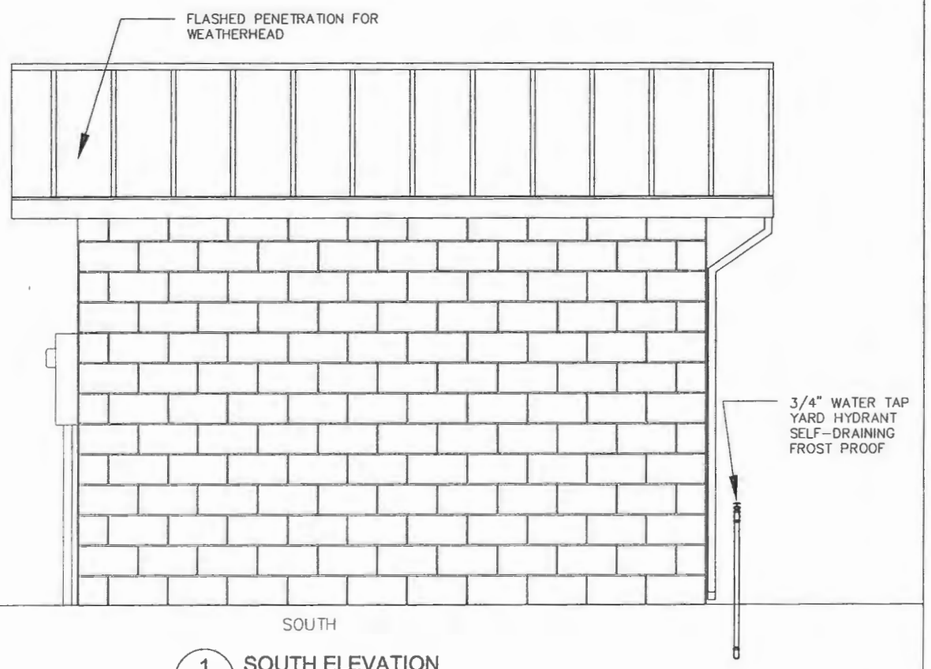
Sheet No. M6
Date 5/29/2011
12 OF 28



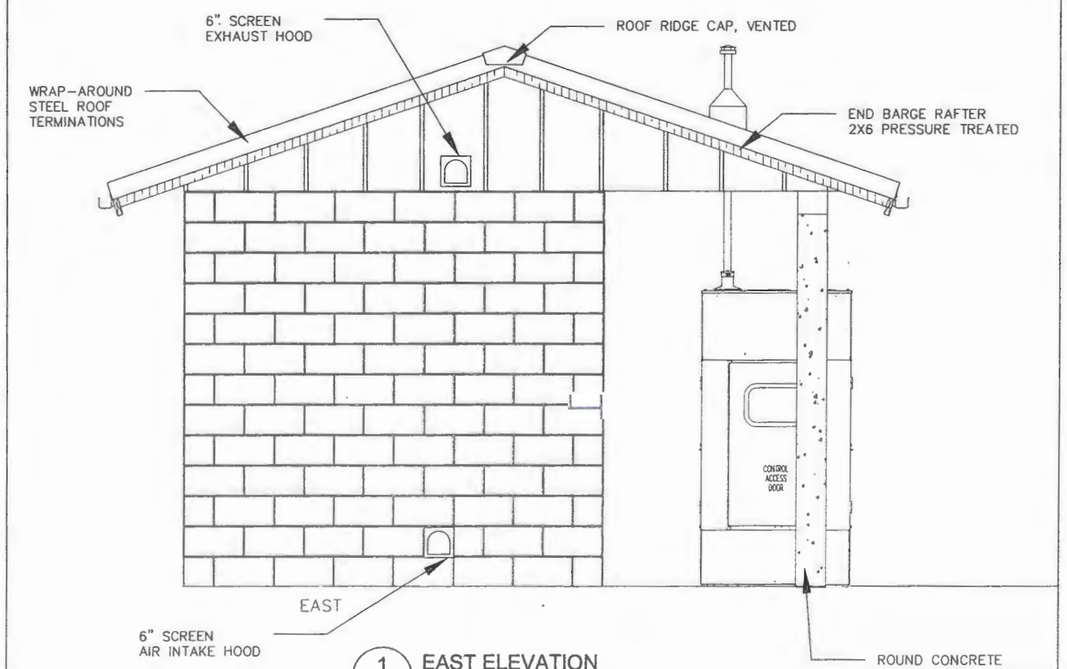
1/S1 WEST ELEVATION
SCALE: 1" = 40"



1/S2 NORTH ELEVATION
SCALE: 1" = 40"



1/S3 SOUTH ELEVATION
SCALE: 1" = 40"



1/S4 EAST ELEVATION
SCALE: 1" = 40"

REGISTERED PROFESSIONAL ENGINEER
50560PE
OREGON
JULY 9, 2001
JAMES G. PALLO
EXPIRATION DATE: 12/31/12

Civil West Engineering Services, Inc.
541-266-8601
www.civilwest.com
486 E Street
Coos Bay, Oregon 97420

REV.	DATE	DESCRIPTION	BY

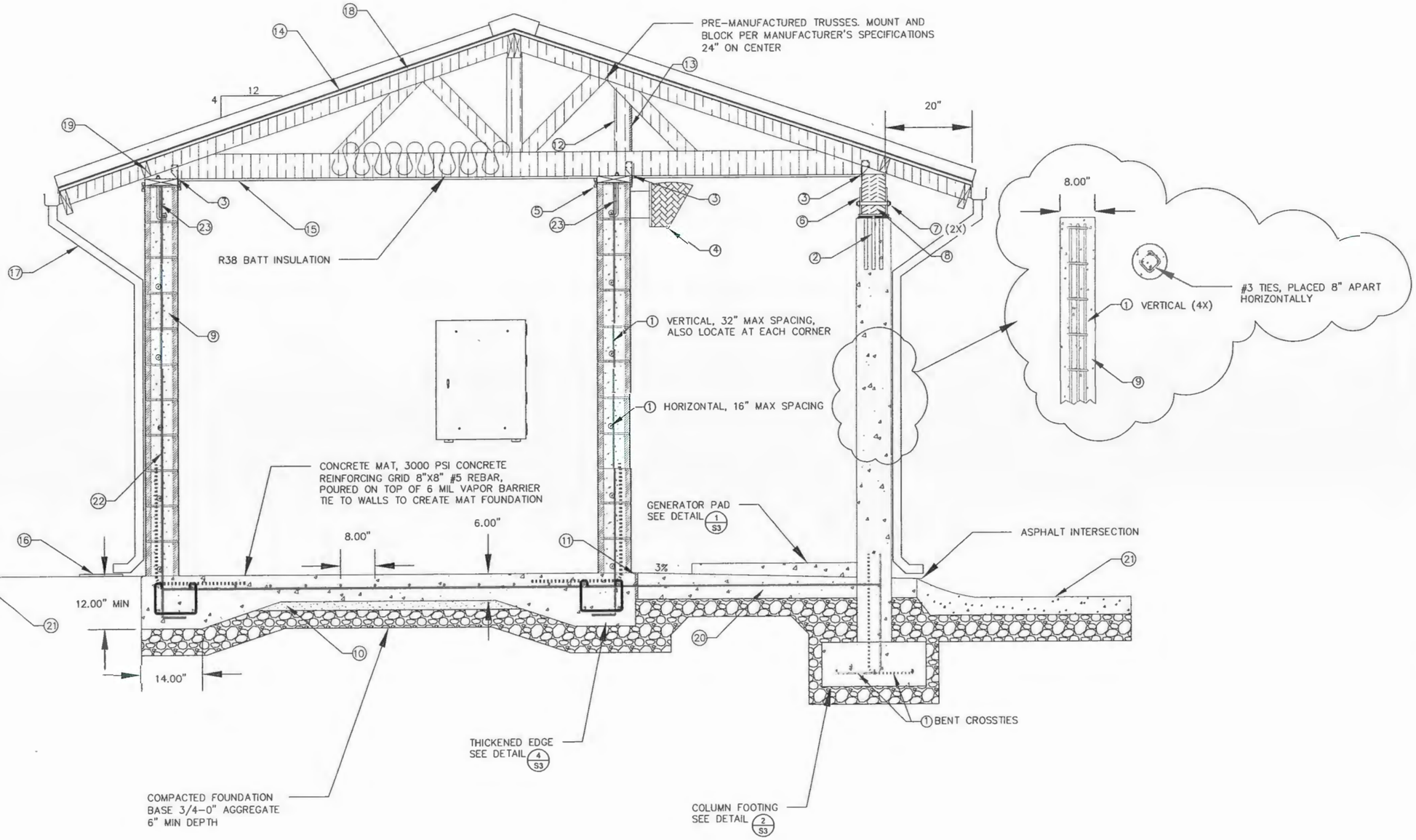
Designed By: JBH
Drawn By: JBH
Checked By: JGP
Project No: 1202-022
File: BASE MAP

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

BUILDING ELEVATIONS

Sheet No: S1
Date: 1/29/2011
13 of 21



① #5 REINFORCING BAR
② #4 ANCHORS ON SIMPSON HGLB TIE
③ HURRICANE TIES, ALL TRUSSES SIMPSON H3
④ OUTDOOR LIGHT
⑤ 1" TRIM PLATE
⑥ SIMPSON HGLBB BEAM SEAT
⑦ ¾" TIE BOLTS
⑧ GRADE #1 DOUG FIR 6"X10"
⑨ FILL COLUMN 2500 PSI CONCRETE
⑩ CLEAN SAND FILL, 2" DEPTH
⑪ EXPANSION/CONTRACTION JOINT FILLER
⑫ 2X4 OUTSIDE WALL
⑬ ½" PLYWOOD OR OSB
⑭ 30LB ROOFING FELT
⑮ ½" HARDIBACKER OR EQUIVALENT
⑯ DOWNSPOUT SPLASH GUARD
⑰ GUTTER AND DOWNSPOUT, TYPICAL 1 PER EAVE
⑱ ⅝" PLYWOOD SHEATHING
⑲ 2X4 EAVE BLOCKING, W/ SCREENED AND VENTED HOLE
⑳ OUTSIDE SLAB, 3000 PSI CONCRETE, 8"X8" #4 REBAR GRID USE #4 REBAR TO DOWEL SLABS AND COLUMNS TOGETHER
㉑ SLOPE GROUND AWAY FROM BUILDING 5% GRADE
㉒ BOND ONE #4 REBAR FOR ELECTRICAL GROUND
㉓ ⅝" J-ANCHOR BOLT

NOTE:

ADD #5 REINFORCING BAR AROUND ALL CMU BLOCK OPENINGS

1/S2 BUILDING SECTION
SCALE: 1" = 25"

REGISTERED PROFESSIONAL ENGINEER
56560PE
OREGON
JULY 9, 2001
JAMES G. PALLO
EXPIRATION DATE: 12/31/12

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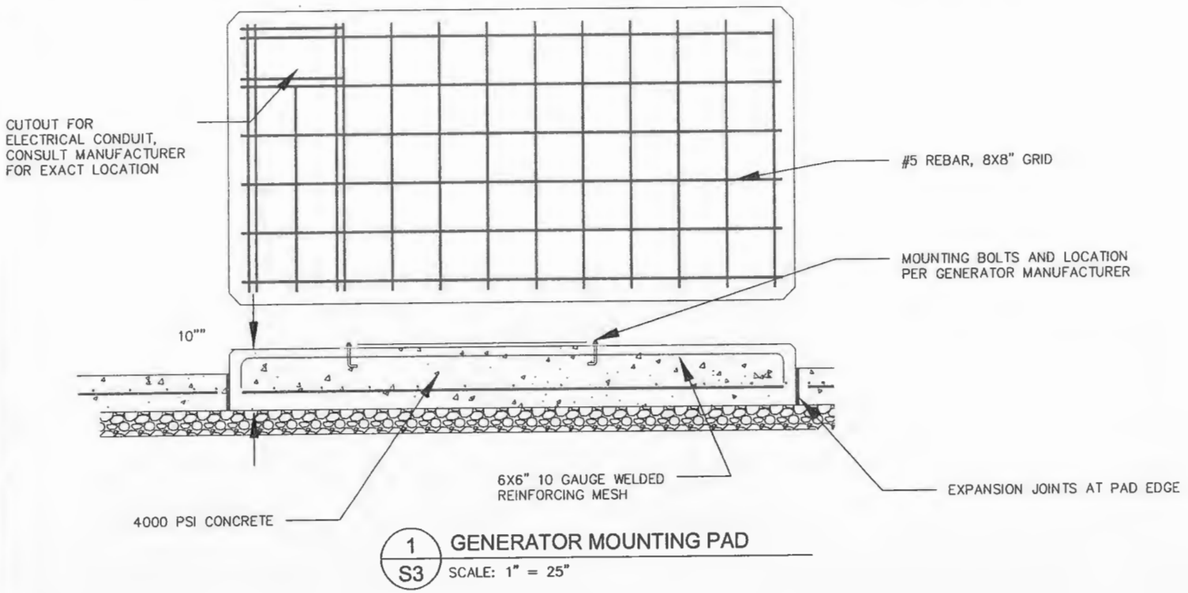
CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

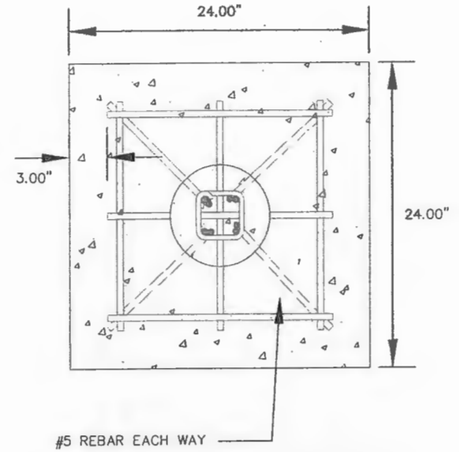
BUILDING SECTION

Sheet No: S2
Date: 1/29/2011
14 OF 28



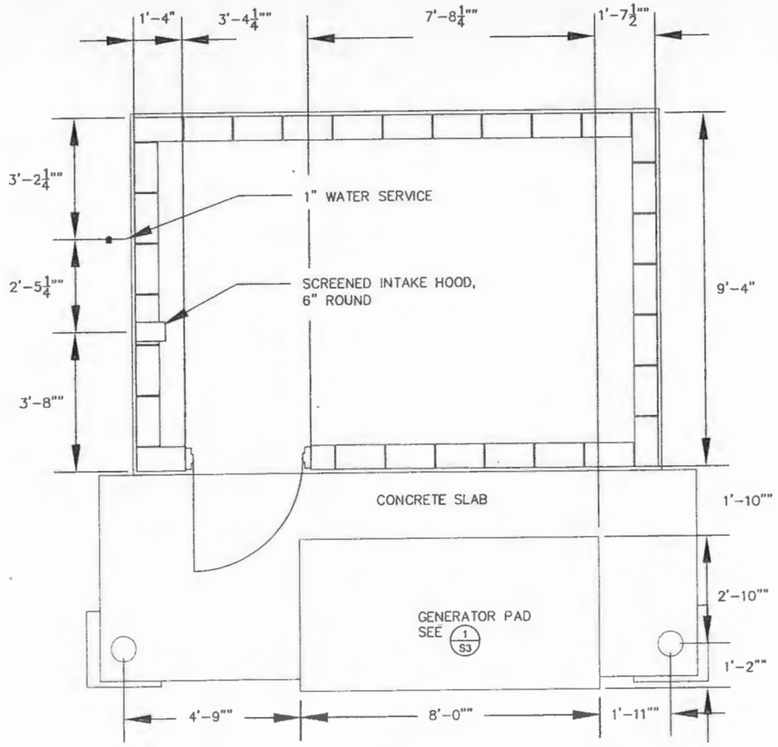
1 / S3 GENERATOR MOUNTING PAD

SCALE: 1" = 25"



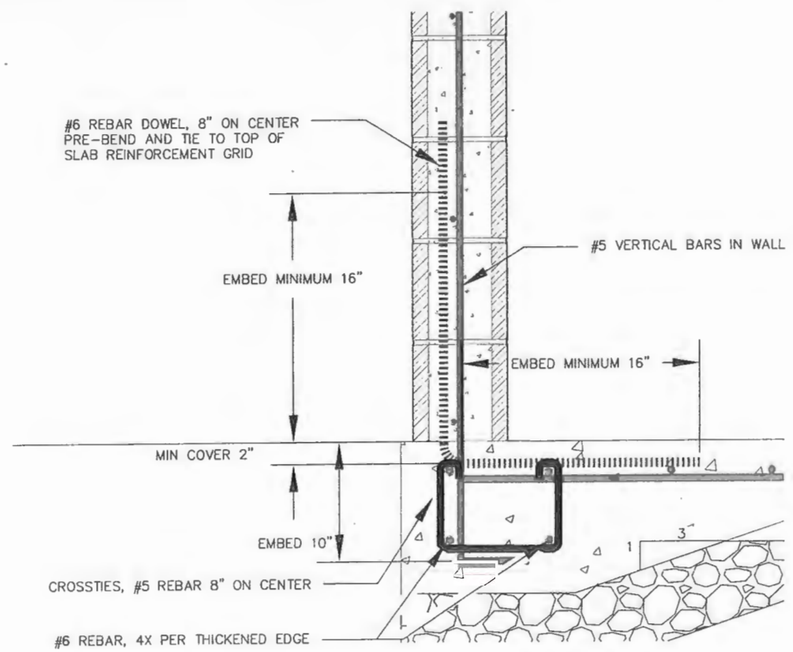
2 / S3 COLUMN FOOTING DETAILS

SCALE: 1" = 1'



3 / S3 FOOTING PLAN DETAILS

SCALE: 1" = 4'



4 / S3 THICKENED EDGE DETAIL

SCALE: 1" = 1'

REGISTERED PROFESSIONAL ENGINEER
50560PE
OREGON
JULY 9, 2004
JAMES G. PALIO

EXPIRATION DATE: 12/31/12

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Coos Bay, Oregon 97420

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CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

STRUCTURE DETAILS

Sheet No. S3

Date 5/29/2011

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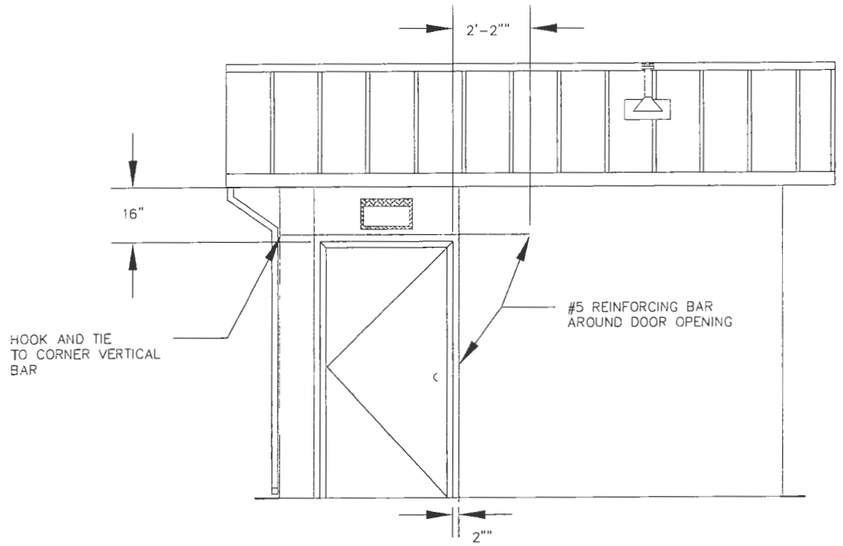
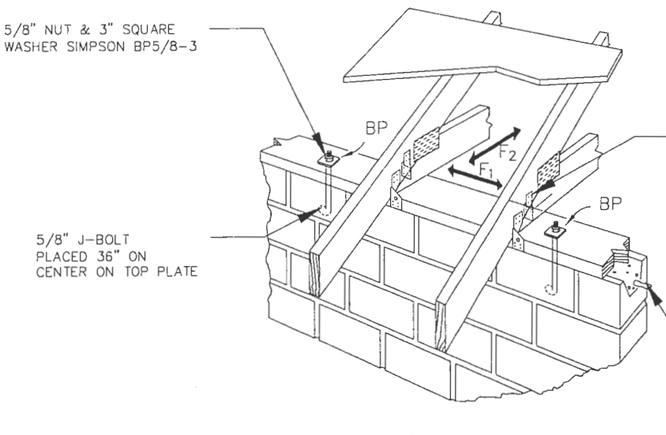


1 / S4 DOOR LINTEL REINFORCEMENT

SCALE: 1" = 50"

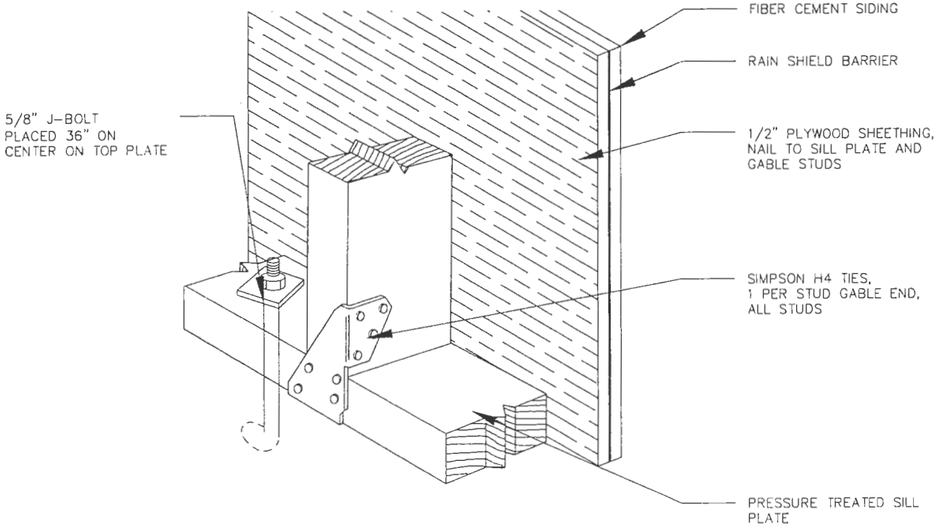


Simpson Strong-Tie
Truss/Rafter to
CMU Single Top Plate

Simpson Strong-Tie
Truss/Rafter to
Overhang Beam

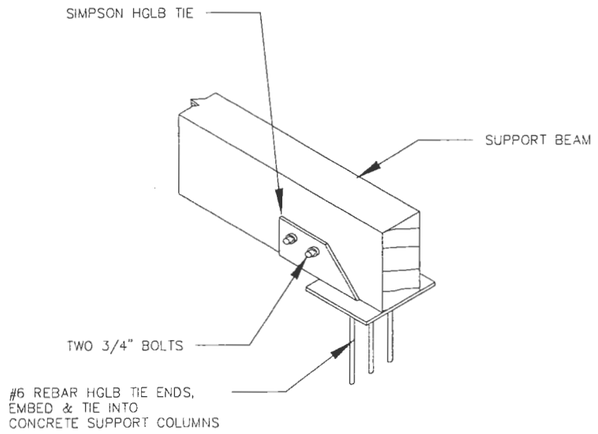
2 / S4 RAFTER TIE DETAILS

NOT TO SCALE



3 / S4 GABLE END TIE DETAILS

NOT TO SCALE



4 / S4 ROOF EAVE SUPPORT BEAM

NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
56560PE
OREGON
JULY 9, 2007
JAMES G. PALLO

EXPIRATION DATE: 12/31/12

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486 E Street
Coos Bay, Oregon 97420

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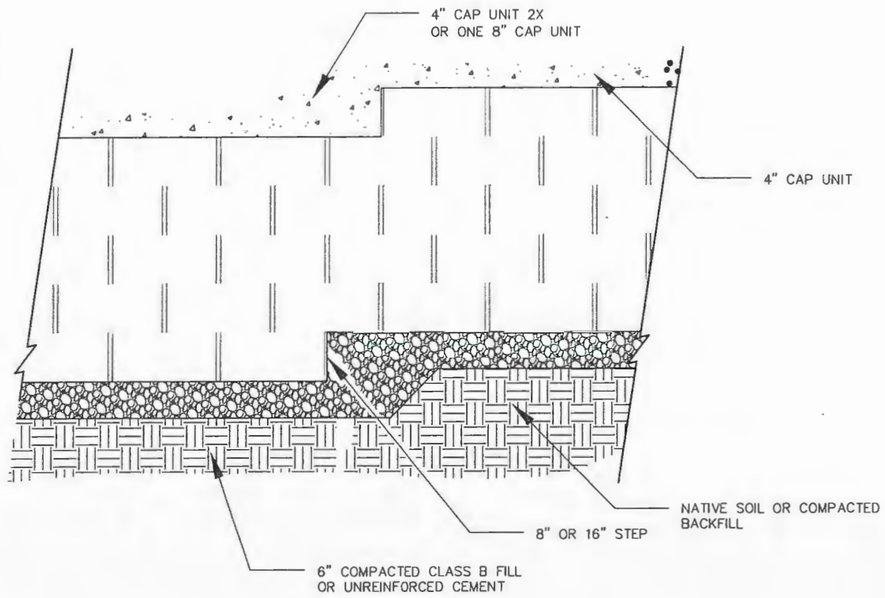
CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

STRUCTURE DETAILS
CONTINUED

Date: 1/29/2011 | Sheet No: S4 | 16 of 28



ADJUST WALL STEP TO MATCH ACCESS RAMP GRADE

1/S5 WALL STEP ELEVATION FOR ACCESS RAMP
NOT TO SCALE

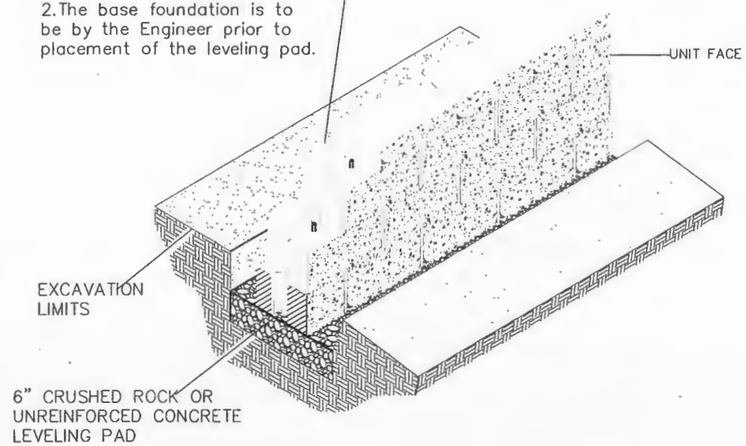
Base Leveling Pad Notes:

1. The leveling pad is to be constructed of crushed stone or 2,000 psi± unreinforced concrete

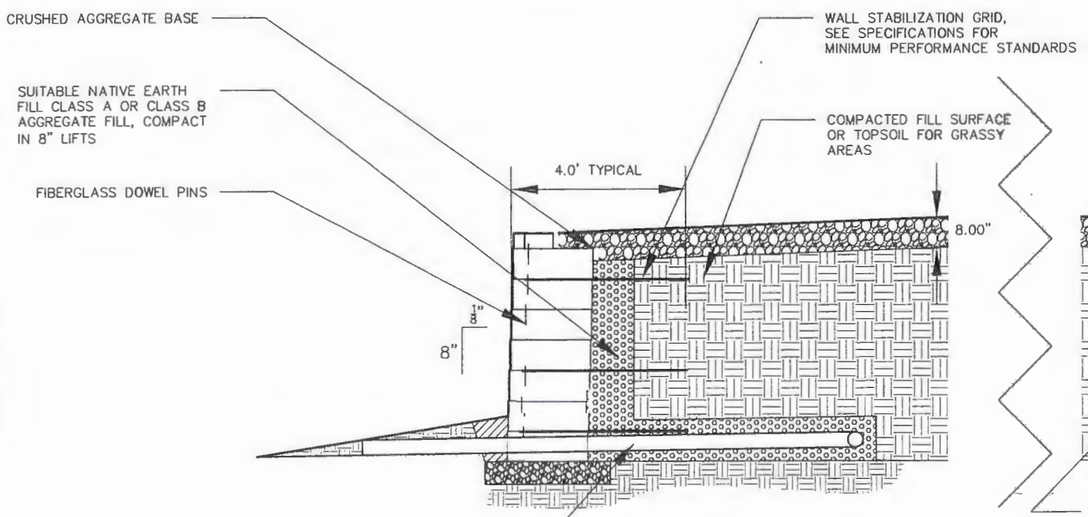
2. The base foundation is to be by the Engineer prior to placement of the leveling pad.

Compact Unit	
Width:	18"
*Depth:	12"
Height:	8"
*Weight:	90 lbs

Cap Unit	
Width:	18"
*Depth:	10 1/2"
Height:	4"
*Weight:	50 lbs

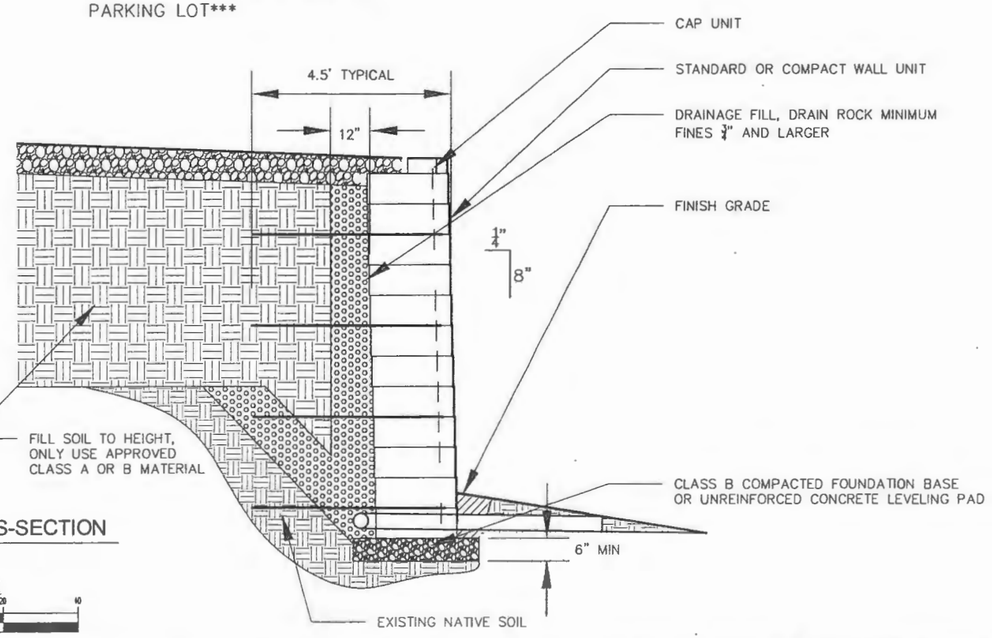


2/S5 ISOMETRIC BASE PAD VIEW
NOT TO SCALE



SHORT SECTION
TYPICAL 4'10" RETAINING WALL SECTIONS FOR NORTH, WEST AND SOUTH WALLS

TALL SECTION
TYPICAL 7' 10" RETAINING WALL SECTION FOR WEST WALL, REPLACING EXISTING RETAINING WALL ADJACENT TO PARKING LOT



3/S5 FILL CROSS-SECTION

PLAN SCALE
20 0 10 20 40

REGISTERED PROFESSIONAL ENGINEER
56560PE
OREGON
JULY 9, 2001
JAMES G. PALLC
EXPIRATION DATE: 12/31/12

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www.civilwest.com
486 E Street
Coos Bay, Oregon 97420

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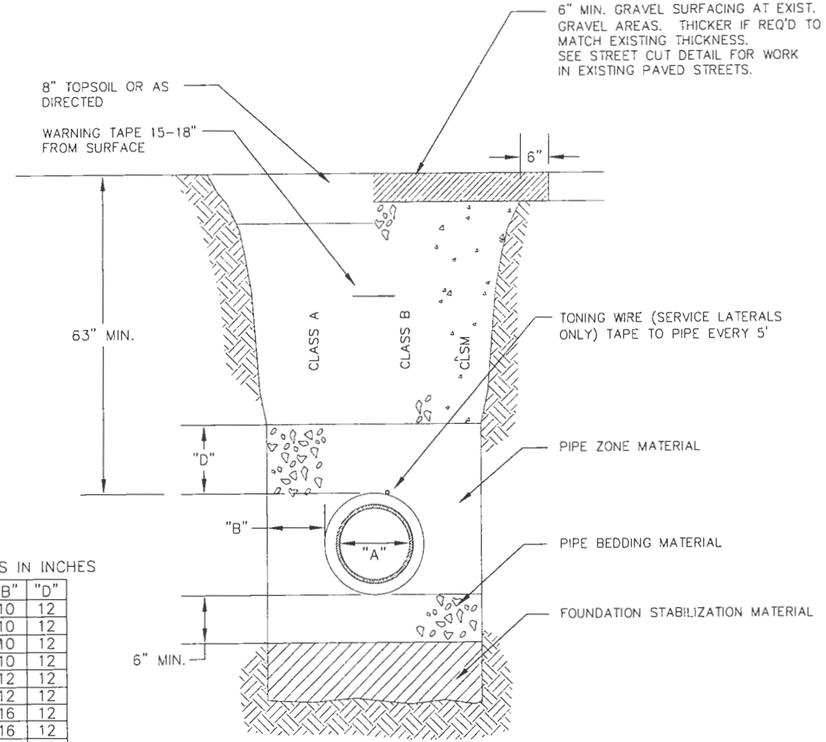
Drawn By: JBH
Checked By: JGP
Project No. 1202-022
File: BASE MAP

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

RETAINING WALL

Date 5/29/2011
Sheet No. S5
17 of 28



DIMENSIONS IN INCHES

"A"	"B"	"D"
4	10	12
6	10	12
8	10	12
10	10	12
12	12	12
15	12	12
18	16	12
21	16	12
24	18	12
30	18	12
36	24	14

NOTES:

1. TRENCH EXCAVATION SHALL BE CONDUCTED IN A SAFE MANNER WITH ALL NECESSARY BRACING AND SHORING PROVIDED FOR COMPLIANCE WITH OSHA.

2. FOUNDATION STABILIZATION SHALL BE PROVIDED WHEN MATERIAL AT BOTTOM OF TRENCH IS UNSUITABLE IN THE OPINION OF THE CITY TO PROVIDE A STABLE TRENCH BASE.

3. CONSTRUCTION IN PUBLIC RIGHT-OF-WAY SHALL COMPLY WITH CITY STANDARDS.

4. CLASS B BACKFILL REQUIRED IN ALL ROADWAYS AND TRAFFIC PATHS EXCEPT WHERE CLSM BACKFILL IS REQUIRED BY COUNTY, ODOT, OR CITY.

5. TONING WIRE REQUIRED AT SERVICE LATERALS. WIRE SHALL BE 12 GA. MINIMUM SOLID COPPER WIRE WITH GREEN 30 MIL THICK HDPE INSULATION RATED FOR DIRECT BURY. USE APPROVED WATERPROOF SPLICE AT ALL CONNECTIONS.

6. WARNING TAPE SHALL BE 6" WIDE, 4 MIL THICK, APWA GREEN, READING "CAUTION SEWER LINE BURIED BELOW".

7. MATERIALS SHALL BE IN ACCORDANCE WITH THE CITY SANITARY SEWER DESIGN STANDARDS MANUAL.

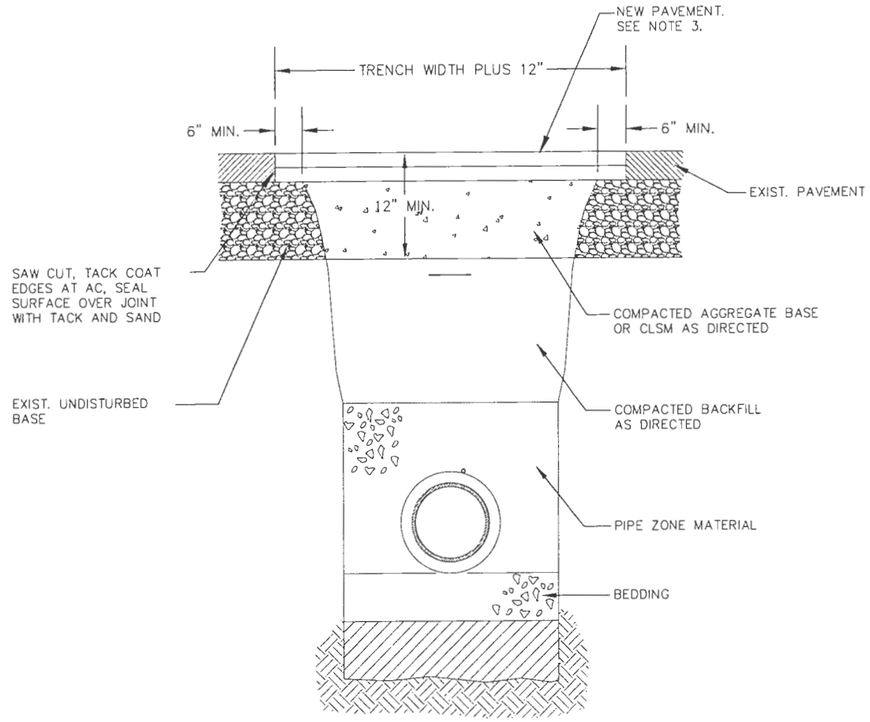
8. COMPACT ALL FILL AS SPECIFIED.

City of Coos Bay
500 Central Ave
Coos Bay, Oregon 97420
541.269.8918

TYPICAL TRENCH DETAIL
SANITARY SEWER

DETAIL NO. S-100
JAN. 2008

1 / D1 TRENCH DETAIL
NOT TO SCALE



NOTES:

1. ALL EXISTING AC OR PCC PAVEMENT SHALL BE SAWCUT IMMEDIATELY PRIOR TO REPAVING.

2. CONCRETE PAVEMENT SHALL BE REPLACED WITH CONCRETE TO A MINIMUM THICKNESS OF 6 INCHES OR TO THE THICKNESS OF REMOVED CONCRETE PAVEMENT, WHICHEVER IS GREATER.

3. PLACE AC MIX TO A MINIMUM THICKNESS OF 4 INCHES OR THE THICKNESS OF REMOVED PAVEMENT, WHICHEVER IS GREATER. COMPACT AS DIRECTED. AC PAVEMENT SHALL BE PLACED IN AT LEAST TWO 2" LIFTS.

4. COMPLY WITH THE REQUIREMENTS OF THE AGENCY HAVING JURISDICTION OVER THE ROAD IN WHICH THE STREET CUT OCCURS.

City of Coos Bay
500 Central Ave
Coos Bay, Oregon 97420
541.269.8918

STREET CUT
STANDARD DETAIL

DETAIL NO. S-105
JAN. 2008

2 / D1 STREET CUT
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
56560PE
OREGON
JULY 9, 200
JAMES G. PALLO
EXPIRATION DATE: 12/31/12

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Engineering Services, Inc.
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www.civilwest.com
486 E Street
Coos Bay, Oregon 97420

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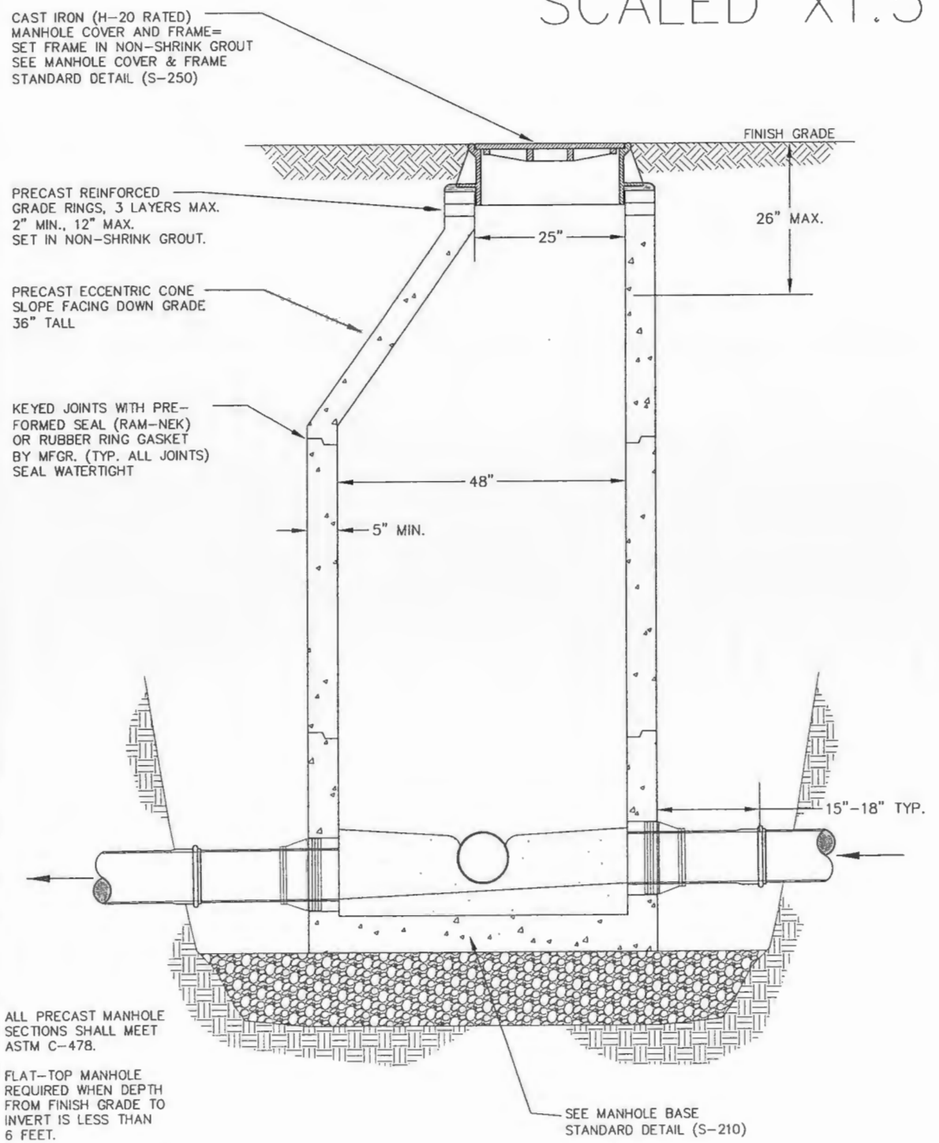
CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENET

STANDARD DETAILS TRENCHING

Date 5/29/2011 | Sheet No D1 | 18 of 28

SCALED X1.5



ALL PRECAST MANHOLE SECTIONS SHALL MEET ASTM C-478.

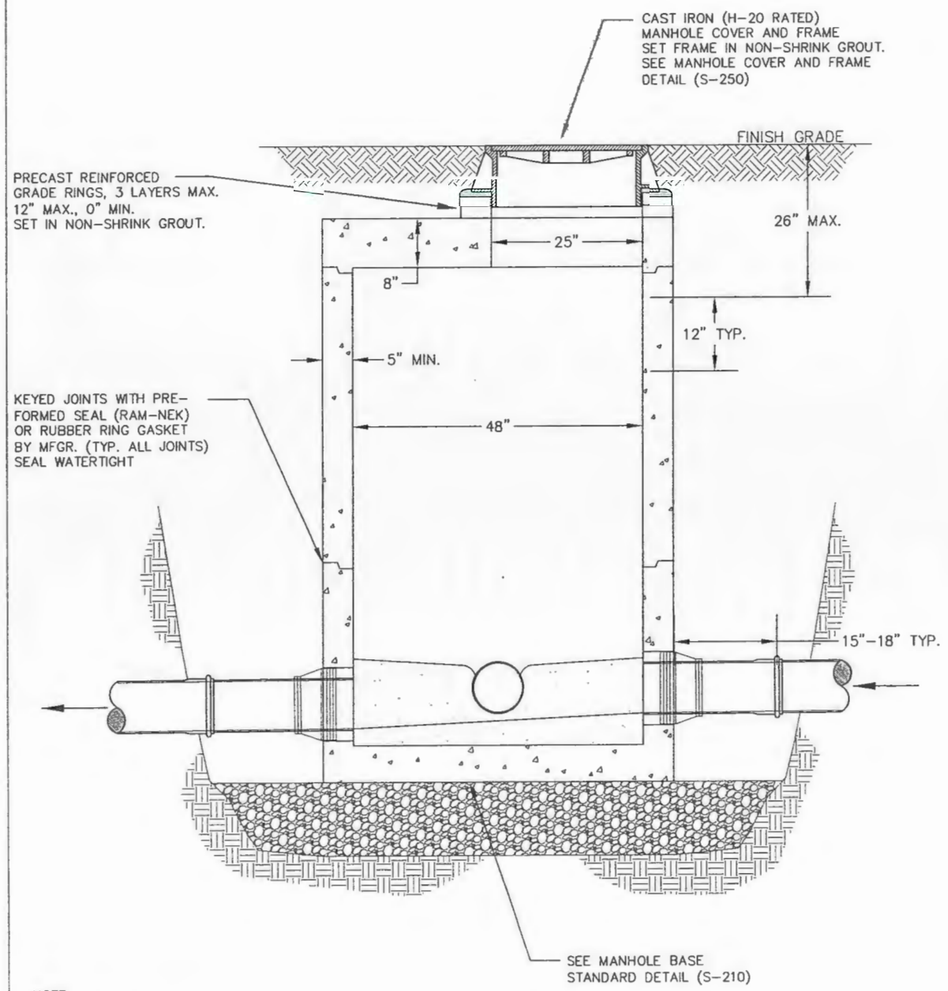
FLAT-TOP MANHOLE REQUIRED WHEN DEPTH FROM FINISH GRADE TO INVERT IS LESS THAN 6 FEET.

INTERIOR DROPS EXCEEDING 24" REQUIRE DROP MANHOLE.

City of Coos Bay 500 Central Ave Coos Bay, Oregon 97420 541.269.8918	STANDARD MANHOLE PIPES LESS THAN 24" DIAM.	DETAIL NO. S-200 JAN. 2008

1 / D2 STANDARD MANHOLE
NOT TO SCALE

SCALED X1.5



NOTE:
1) ALL PRECAST MANHOLE SECTIONS SHALL MEET ASTM C-478.

2) STANDARD MANHOLE REQUIRED WHEN DEPTH FROM FINISH GRADE TO INVERT IS 6 FEET OR MORE.

City of Coos Bay 500 Central Ave Coos Bay, Oregon 97420 541.269.8918	FLAT-TOP MANHOLE PIPES LESS THAN 24" DIAM.	DETAIL NO. S-205 JAN. 2008

2 / D2 FLAT TOP MANHOLE
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
56660PE
OREGON
JULY 9, 2001
JAMES G. PALLO
EXPIRATION DATE: 12/31/12

Civil West Engineering Services, Inc.
541-266-8601
www.civilwest.com
486 E Street
Coos Bay, Oregon 97420

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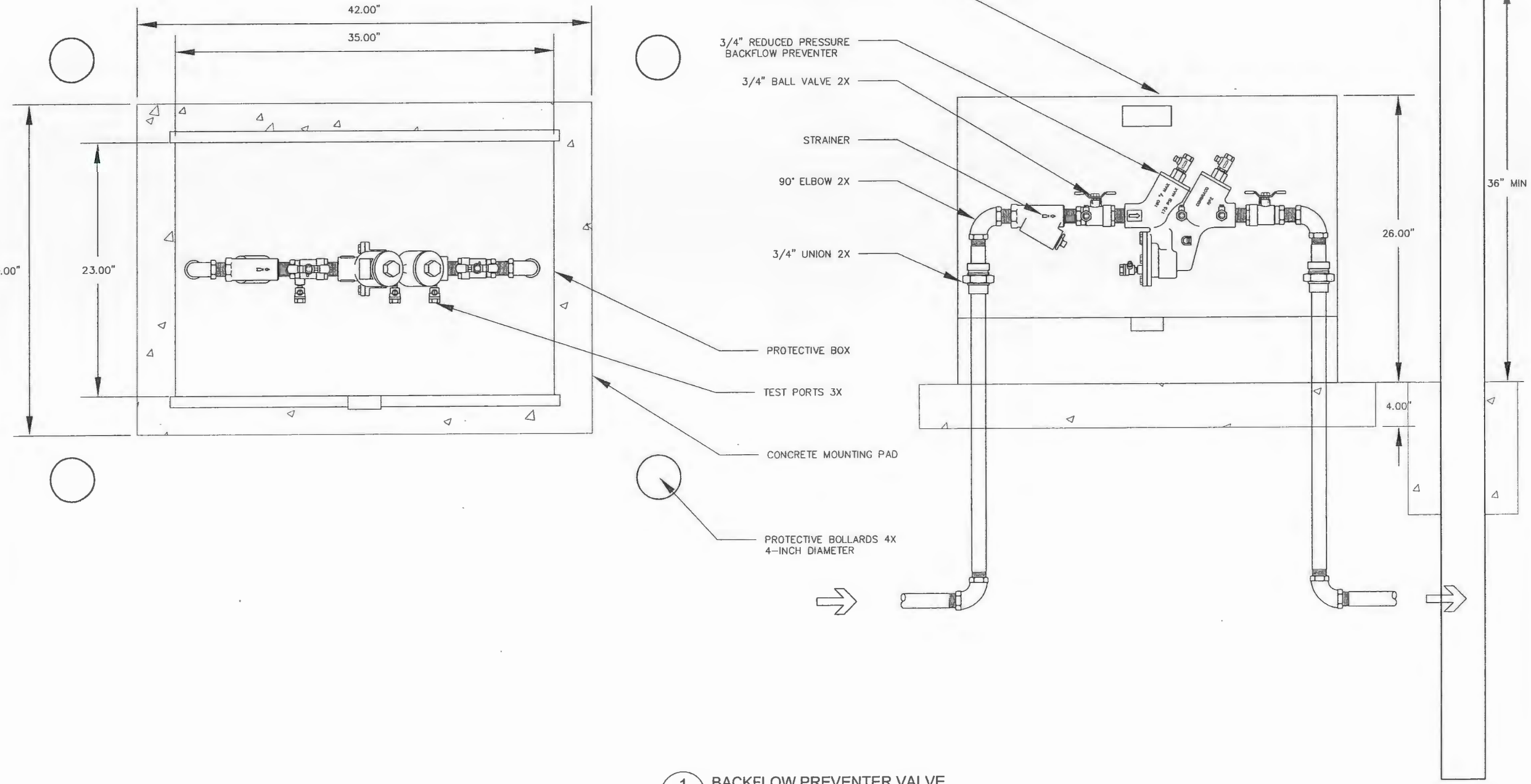
Drawn By: JBH
Checked By: JGP
File: BASE MAP
Project No: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

STANDARD DETAILS MANHOLES

Date: 5/29/2011
Sheet No: D2



1/D3 BACKFLOW PREVENTER VALVE

PLAN SCALE

10" 0 5" 10" 20"

REGISTERED PROFESSIONAL ENGINEER
56560PE
OREGON
JULY 9, 2001
JAMES G. PALLO
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Drawn By: JBH
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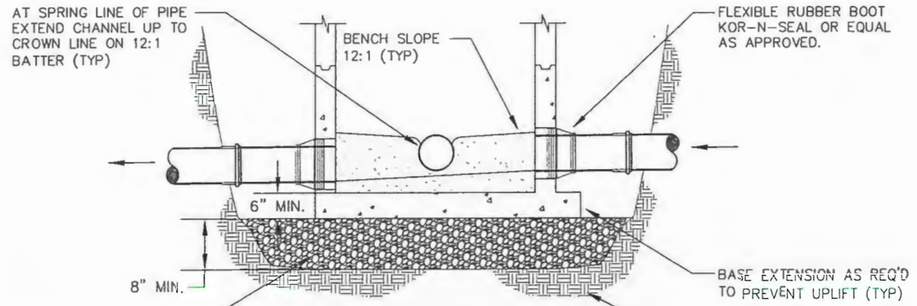
File: BASE MAP
Project No: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

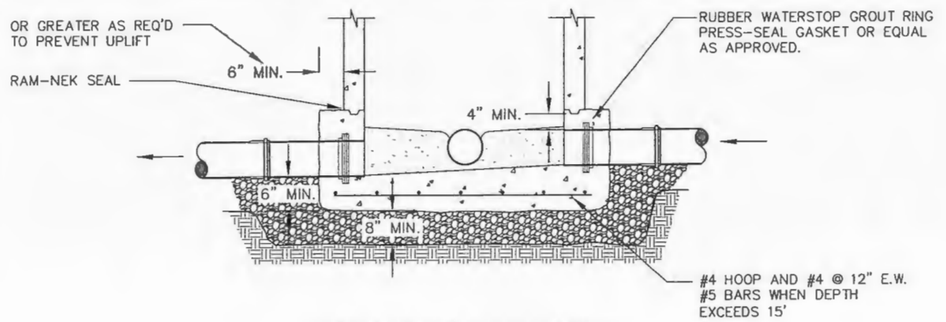
BACKFLOW PREVENTER DETAILS

Date: 5/29/2011
Sheet No: D3
20 of 28

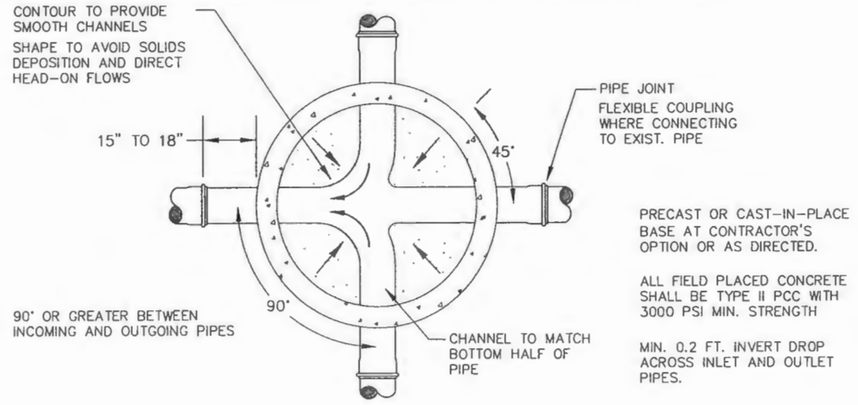


PRECAST BASE

PRECAST BASE HEIGHT SUFFICIENT TO AVOID JOINT AT PIPE PENETRATIONS



CAST-IN-PLACE BASE



PRECAST OR CAST-IN-PLACE BASE AT CONTRACTOR'S OPTION OR AS DIRECTED.

ALL FIELD PLACED CONCRETE SHALL BE TYPE II PCC WITH 3000 PSI MIN. STRENGTH

MIN. 0.2 FT. INVERT DROP ACROSS INLET AND OUTLET PIPES.

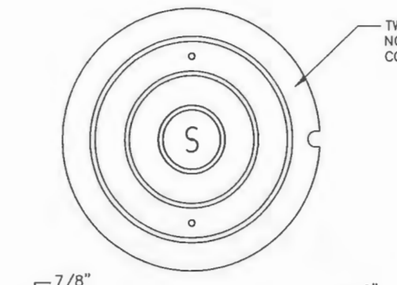
City of Coos Bay
500 Central Ave
Coos Bay, Oregon 97420
541.269.8918

MANHOLE BASE STANDARD DETAILS

DETAIL NO. S-210

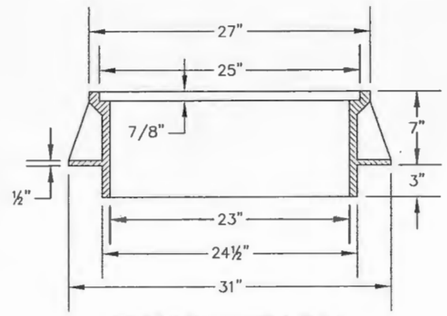
JAN. 2008

1 / D4 MANHOLE BASE
NOT TO SCALE



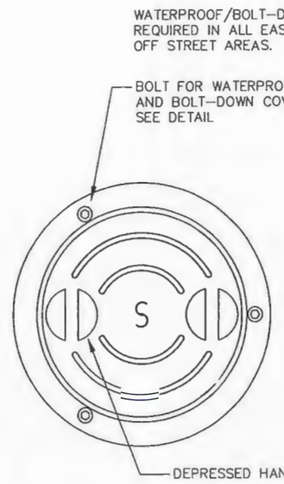
COVER (150 LBS)

(OLYMPIC FOUNDRY MH26S, OR APPROVED EQUAL)

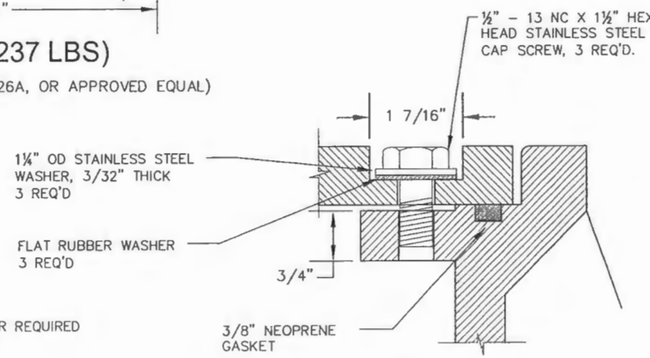


FRAME (237 LBS)

(OLYMPIC FOUNDRY MH26A, OR APPROVED EQUAL)



(OLYMPIC FOUNDRY MH26WT, OR APPROVED EQUAL)



BOLT DOWN DETAIL

NOTE:
1) TAMPER PROOF FRAME AND COVER REQUIRED OUTSIDE OF RIGHT OF WAY OR IN UNDEVELOPED AREAS.
2) MANHOLE FRAMES AND COVER SHALL HAVE H-20 RATING

City of Coos Bay
500 Central Ave
Coos Bay, Oregon 97420
541.269.8918

MANHOLE COVER AND FRAME DETAILS

DETAIL NO. S-250

JAN. 2008

2 / D4 MANHOLE COVER & FRAME
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
56560PE
OREGON
JULY 9, 2001
JAMES G. PALLO
EXPIRATION DATE: 12/31/12

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REV.	DATE	DESCRIPTION	BY

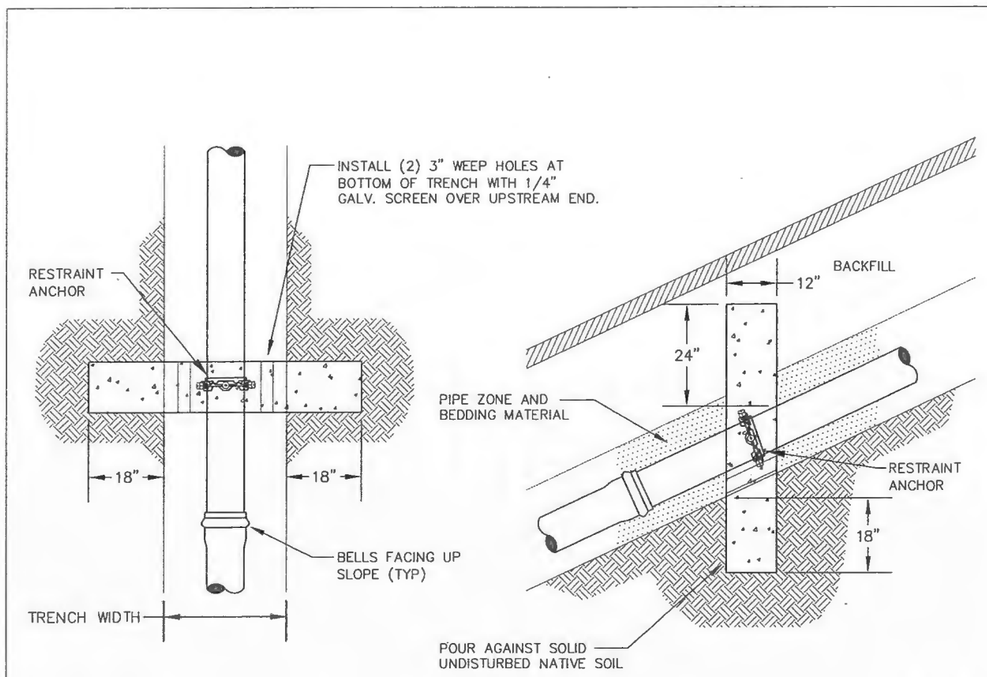
Designed By: JBH
Drawn By: JBH
Checked By: JGP
Project No: 1202-022
File: BASE M&P

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

STANDARD DETAILS
MANHOLE BASE AND COVER

Detail / Sheet No: D4
1/29/2011
21 OF 28



NOTES:

1. CUT–OFF WALLS REQ'D AT ALL PIPELINES WHERE SLOPE EXCEEDS 20%.
2. RESTRAINED JOINT PIPE REQUIRED AT SLOPES BETWEEN 15% AND 20%.
3. WALLS SHALL BE FORMED WITHIN TRENCH. REMOVE FORMS PRIOR TO BACKFILLING.
4. CONCRETE SHALL HAVE 3000 PSI COMPRESSIVE STRENGTH MIN. (CLASS 3000).
5. SPACING OF WALLS SHALL BE:

SLOPE	SPACING
20–34%	35 FEET
35–50%	25 FEET
51–+%	15 FEET

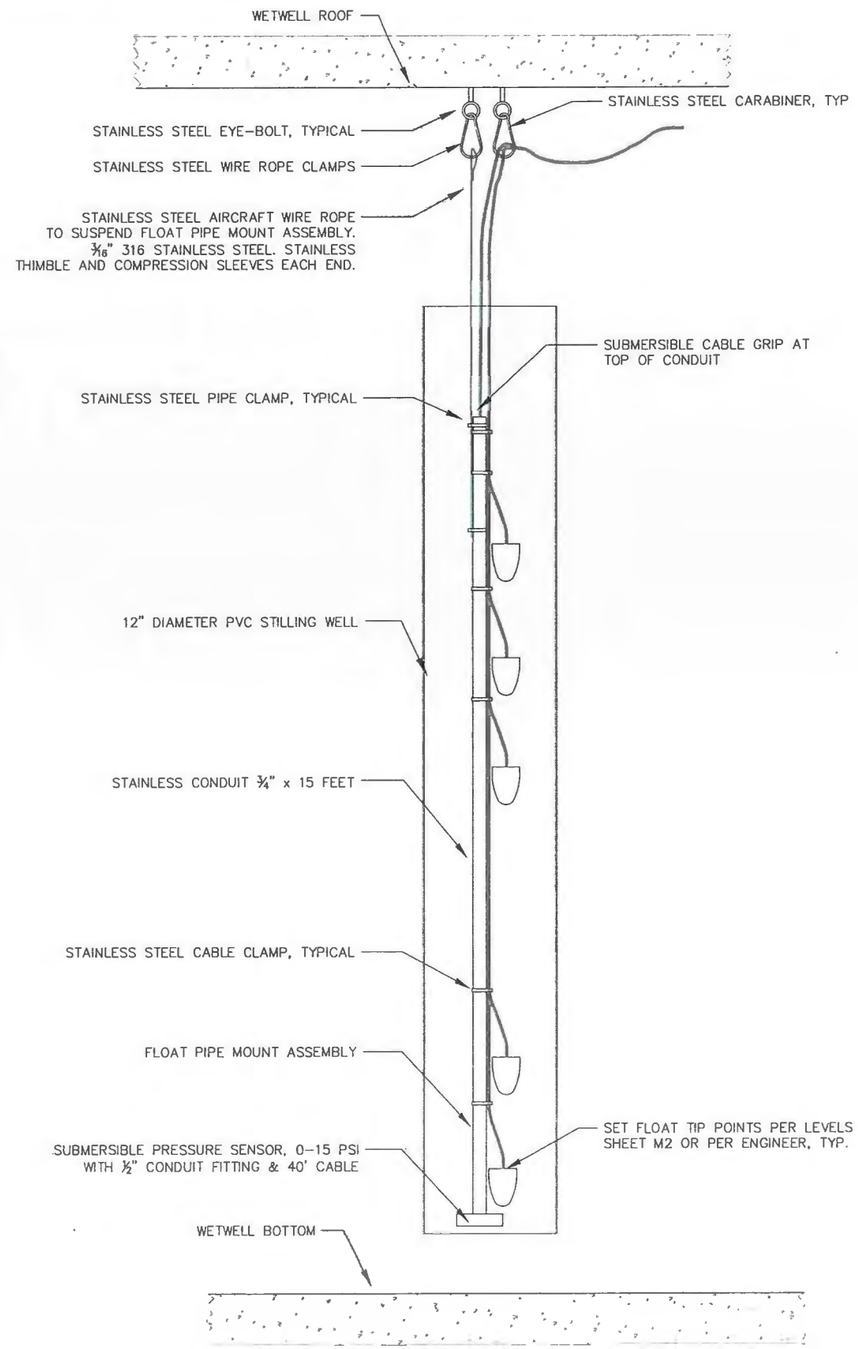
City of Coos Bay 500 Central Ave Coos Bay, Oregon 97420 541.269.8918	PIPE ANCHOR / TRENCH CUT-OFF WALL DETAIL	DETAIL NO. S-150 JAN. 2008

1/D5 CUT OFF WALL
NOT TO SCALE

NOTE:

LOCATE EYE BOLTS WITHIN REACH FROM THE SURFACE THROUGH THE ACCESS HATCH.

LOCATE PRESSURE SENSOR IN CLEAR AREA BETWEEN PUMPS IN ACCORDANCE WITH MFG RECOMMENDATIONS.



2/D5 WETWELL SENSOR TREE
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
56560PE
OREGON
JULY 9, 2001
JAMES G. PALLO
EXPIRATION DATE: 12/31/12

Civil West Engineering Services, Inc.
541-266-8601
www.civilwest.com
486 E Street
Coos Bay, Oregon 97420

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Designed By: JBH
Drawn By: JBH
Checked By: JGP
File: BASE MAP
Project No: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

STANDARD DETAILS CUT OFF WALL
SENSOR TREE DETAILS

Date: 1/29/2011
Sheet No: D5
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FABRICATION NOTES:

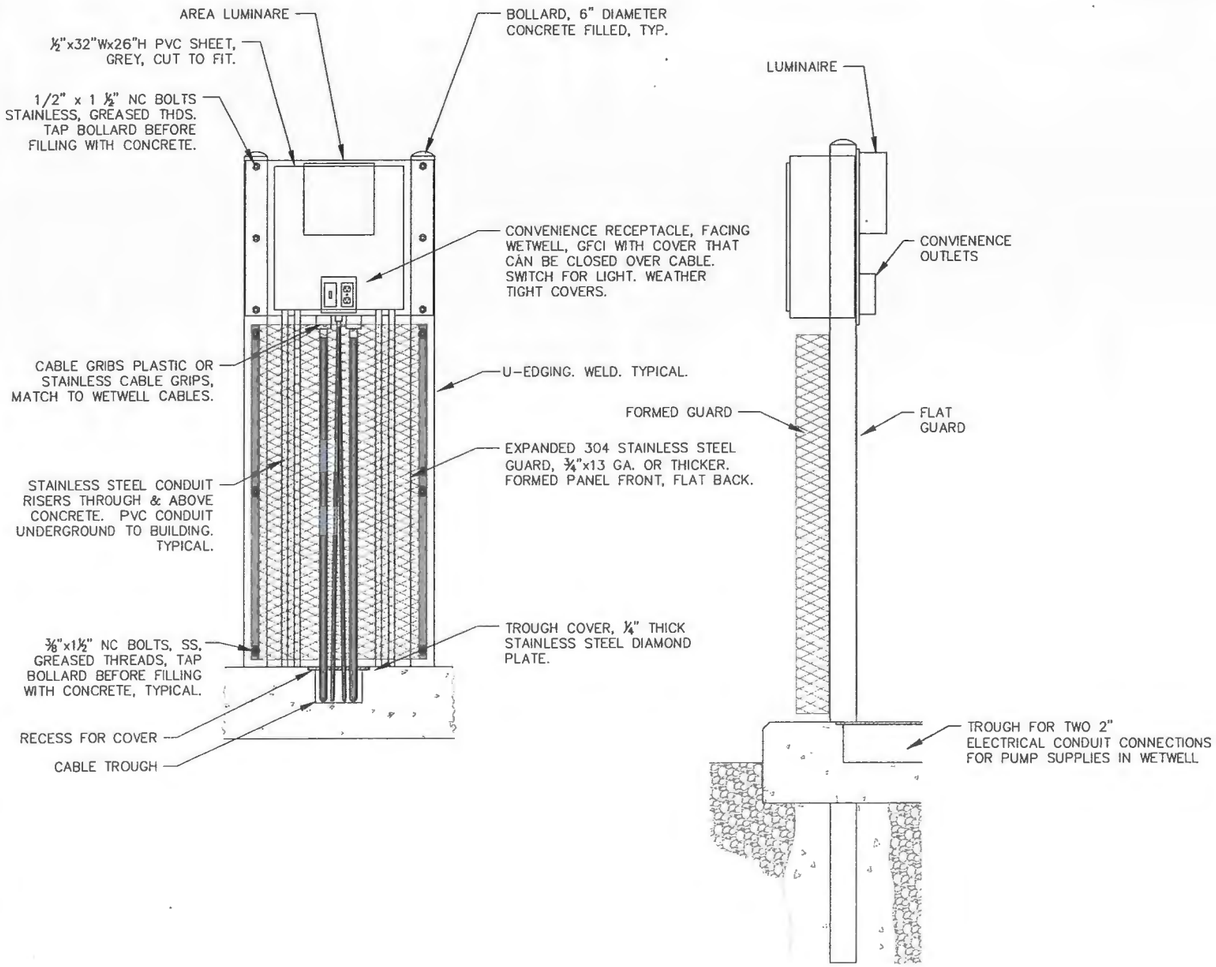
DIMENSION SCALE IS APPROXIMATE. VERIFY ALL DIMENSIONS BY ACTUAL MATERIALS USED AND SITE CONDITIONS.

ALL MOUNTING HARDWARE SHALL BE STAINLESS STEEL UNLESS OTHERWISE NOTED. PANEL & SHEET MOUNTING BOLTS SHALL INCLUDE STAINLESS STEEL WASHERS & SPLIT RING LOCK WASHERS.

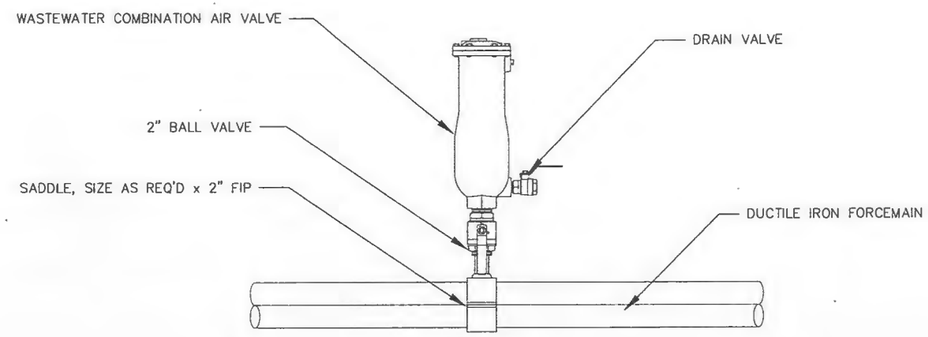
DRILL & TAP FASTENERS TO THE BOLLARD UPRIGHTS. GREASE ALL BOLTS BEFORE INSTALLATION. FILL BOLLARDS WITH CONCRETE AFTER INSTALLING BOLTS. ALL BOLTS SHALL BE REMOVABLE AFTER CONSTRUCTION.

PRIME & PAINT BOLLARDS WITH OIL BASED ENAMEL SPECIALLY FORMULATED FOR COATING OVER GALVANIZED STEEL. COLOR GREY TO MATCH PVC SHEET.

RADIUS ALL EXPOSED EDGES & CORNERS OF SHEETING AND HARDWARE SUCH THAT EDGES ARE NOT SHARP.



1 / D6 WETWELL PANEL & JUNCTION BOX
NOT TO SCALE



2 / D6 2" WW COMB. AIR VALVE DETAIL
NOT TO SCALE

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CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

WETWELL PANEL DETAILS
COMBINATION AIR RELEASE DETAILS

Sheet No. D6
Date 1/29/2011
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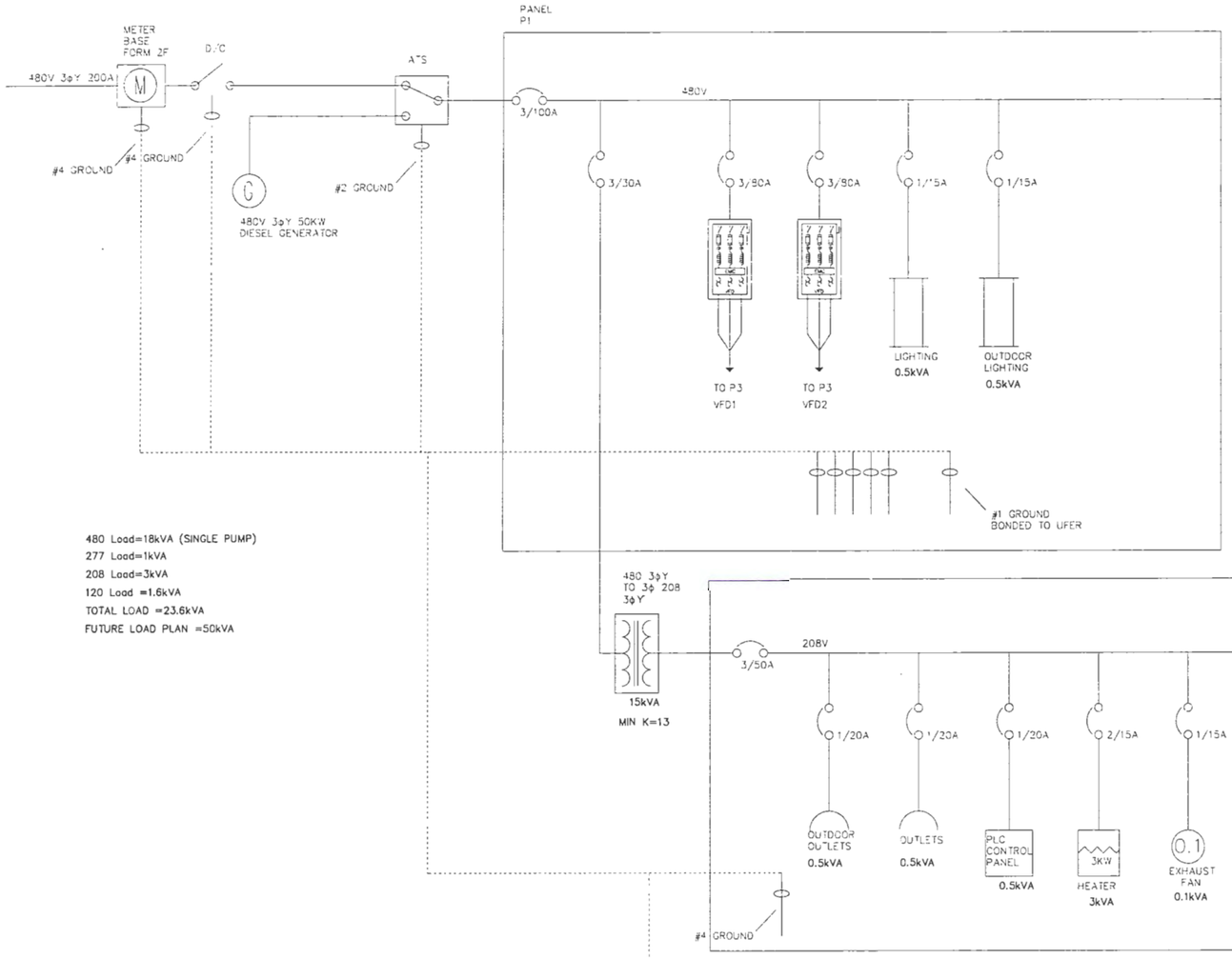

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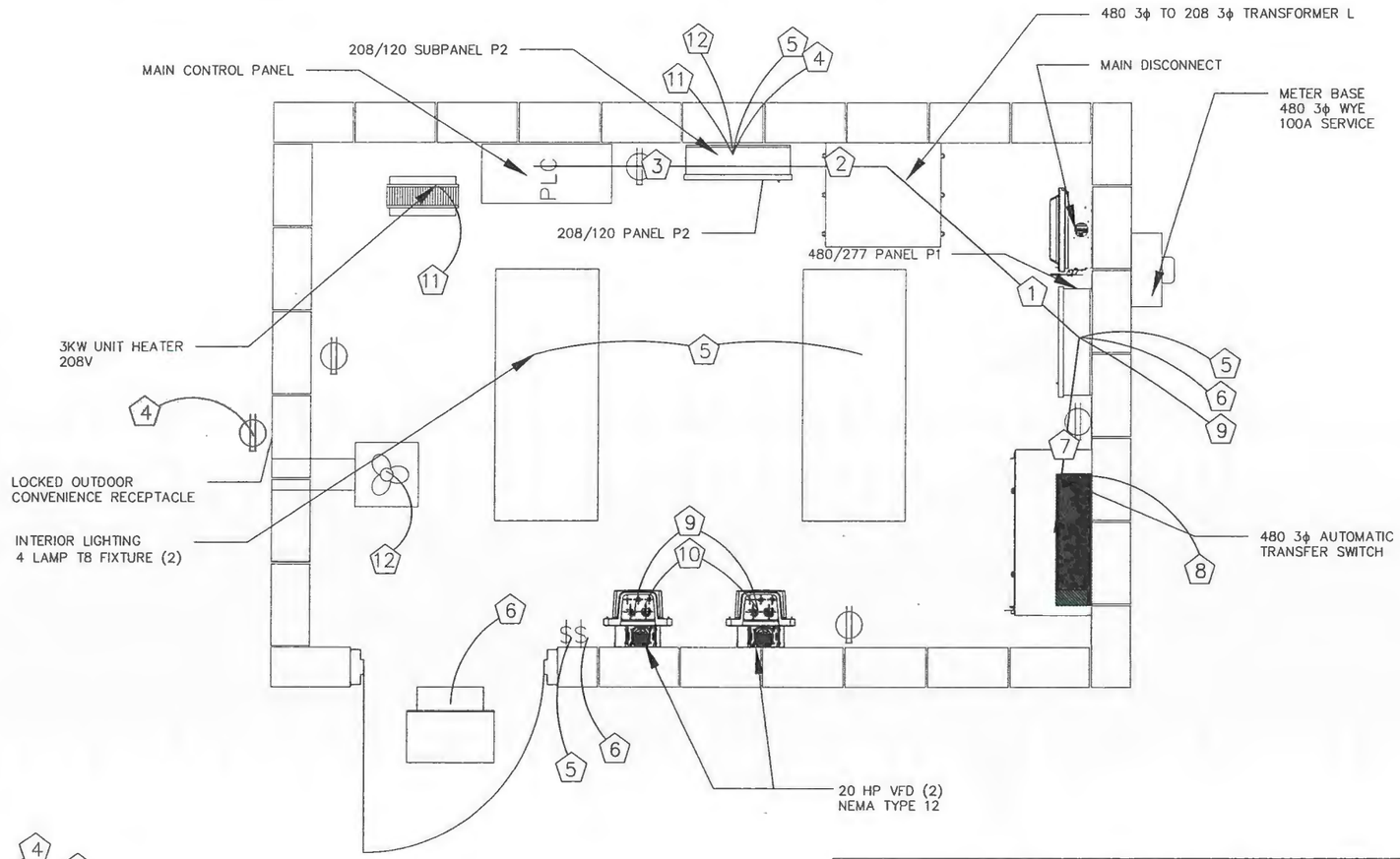
File BASE MAP
Project No 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

ONE LINE DIAGRAM

Date 1/29/2011
Sheet No E1
24 of 28



1. MAIN DISTRIBUTION PANEL TO TRANSFORMER
2. 480/208 TRANSFORMER TO SUBPANEL
3. SUBPANEL TO PLC CONTROL PANEL
4. OUTDOOR POWER CIRCUIT
5. INDOOR LIGHTING
6. OUTDOOR LIGHTING
7. 480 VOLT TO TRANSFER SWITCH
8. GENERATOR BACKUP POWER TO TRANSFER SWITCH
9. MAIN PANEL TO MOTOR DRIVES
10. MOTOR DRIVES TO SUBMERSIBLE PUMPS
11. SUBPANEL TO ELECTRIC HEATER
12. VENTILATION FAN
13. INDOOR CONVENIENCE RECEPTACLE CIRCUIT

INSTALL 3" PVC CONDUIT AS SHOWN ON PLAN SHEETS FOR UTILITY POWER
SEE (1/C2) (1/C3)

NOTES:

1. CONTRACTOR MAY COMBINE CONDUIT RUNS PROVIDING NO RACEWAY EXCEEDS 30% CROSS SECTION OF CONDUCTORS TO TUBING

EXCEPTION: PUMP CONNECTIONS TO WETWELL CONTROL PANEL MUST HAVE INDIVIDUAL 2" CONDUITS

2. ALL ABOVE-GROUND OUTDOOR CONDUIT SHALL BE STAINLESS RIGID

ELECTRICAL CONDUIT SCHEDULE

CONDUIT #	MIN CONDUIT SIZE	TYPE	WIRE	RATING
1	1"	EMT	#6 THHN 4-CONDUCTOR	480V/50A
2	1 1/2"	EMT	#2 THHN 4-CONDUCTOR	208V/115A
3	1/2"	EMT	#12 THHN 2-CONDUCTOR	120V/20A
4	1/2"	EMT/PVC	#12 THHN 2-CONDUCTOR	120V/20A
5	1/2"	EMT	#14 THHN 2-CONDUCTOR	277V/5A
6	1/2"	EMT/PVC	#12 THHN 2-CONDUCTOR	277V/5A
7	1 1/2"	EMT	#2 THHN 4-CONDUCTOR	480V/100A
8	1 1/2"	RIGID/PVC	#2 THHN 4-CONDUCTOR	480V/100A
9	1"	EMT	#10 THHN 8-CONDUCTORS	480V/25A
10	2"	PVC/RIGID	#8 SHEILDED TWISTED SETS (2)	480V/25A
11	1/2"	EMT	#12 THHN 3-CONDUCTORS	208V/20A
12	1/2"	EMT	#14 THHN 2-CONDUCTORS	120V/5A
13	1/2"	EMT	#12 THHN 2-CONDUCTORS	120V/15A

REGISTERED PROFESSIONAL ENGINEER
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JAMES G. PALLO
EXPIRATION DATE: 12/31/12

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Drawn By: JBH
Checked By: JGP
File: BASE MAP
Project No: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

ELECTRICAL CONDUIT

Date: 5/29/2011
Sheet No: E2
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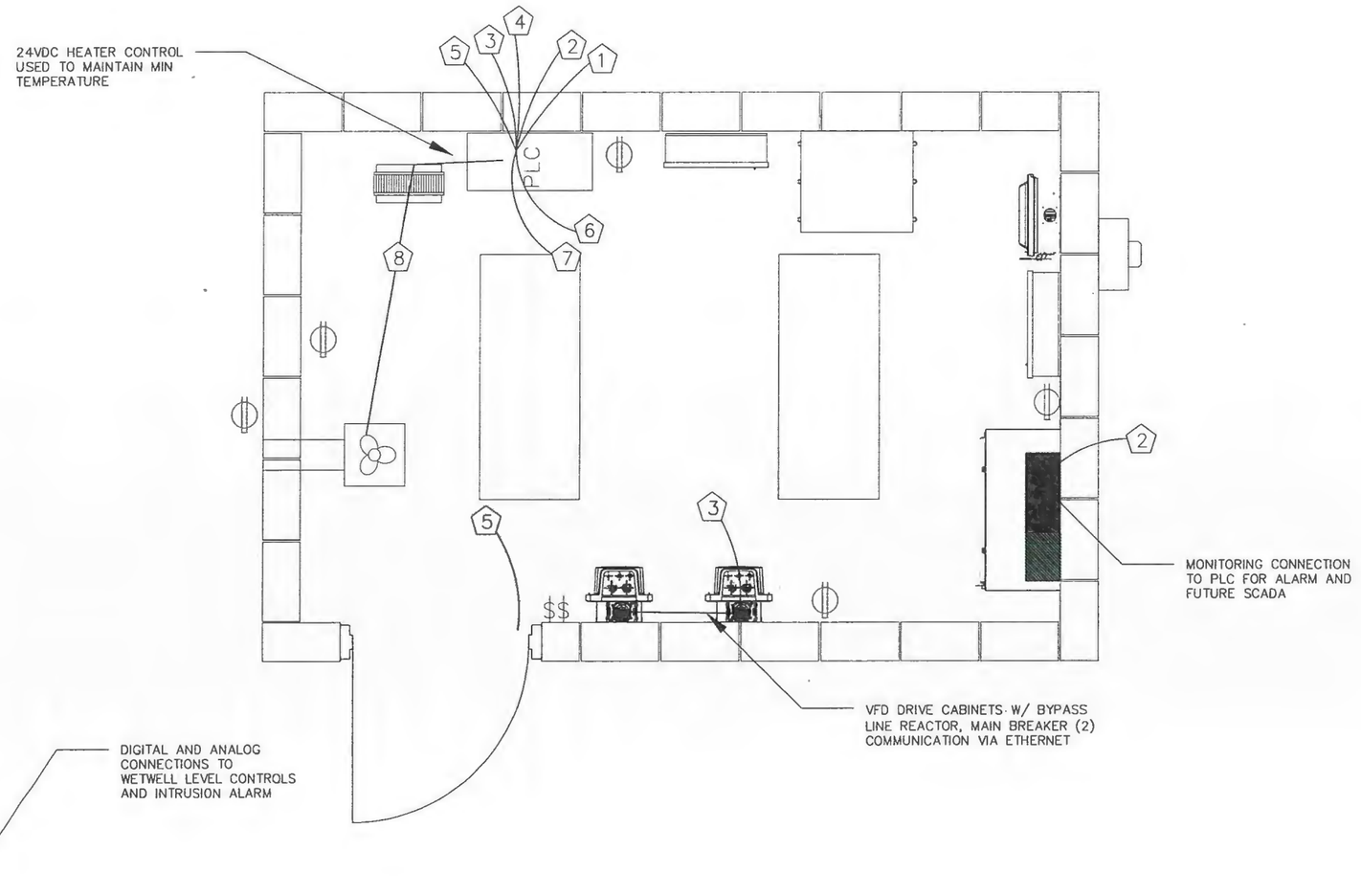

1. TO FLOW MAGMETER VAULT
2. ETHERNET GENERATOR MONITORING
3. ETHERNET VFD CONTROL
4. VALVE VAULT PRESSURE AND LIMIT SWITCHES
5. DOOR INTRUSION ALARM
6. WETWELL 110V FLOATS
7. WETWELL PRESSURE TRANSDUCER & REDUNDANT FLOATS
8. THERMOSTAT CONTROL FOR HEATER AND EXHAUST

CONTROL CONDUIT SCHEDULE

CONDUIT #	MIN CONDUIT SIZE	TYPE	CIRCUIT TYPE	CIRCUIT(S)
1	3/4"	PVC	4-20MA ANALOG	FLOWMETER
2	1/2"	PVC OR EMT	ETHERNET	ATS MONITORING
3	3/4"	PVC OR EMT	ETHERNET	PUMP 1 VFD, PUMP 2 VFD
4	1/2"	PVC	4-20MA ANALOG, 24V DIGITAL	VALVE VAULT
5	1/2"	PVC OR EMT	24V DIGITAL	DOOR INTRUSION ALARM
6	1"	PVC	110V AC	WETWELL FLOATS (3)
7	1"	PVC	4-20MA ANALOG, 24V DIGITAL	WETWELL TRANSDUCER, FLOATS, INTRUSION ALARM, OVERFLOW METER
8	1/2"	PVC OR EMT	24V DIGITAL	THERMOSTAT

REGISTERED PROFESSIONAL ENGINEER
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JULY 9, 2001
JAMES G. PALLO
EXPIRATION DATE: 12/31/12

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File: BASE MAP
Project No. 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

ELECTRICAL CONTROL CONDUIT

Sheet No. E3
Date 1/29/2011
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ELECTRICAL PANEL 1, 100 AMP MAIN BREAKER, 480/277V, AIC RATING 10,000A										
WIRE	POSITION	CIRCUIT	BREAKER SIZE	ESTIMATED LOAD	PHASE	ESTIMATED LOAD	BREAKER SIZE	CIRCUIT	POSITION	WIRE
101	1	SURGE	60A	PEAK SURGE	A	2KW	50A	TRANSFORMER	2	102
103	3	SURGE		PEAK SURGE	B	2KW		TRANSFORMER	4	104
105	5	SURGE		PEAK SURGE	C	600W		TRANSFORMER	6	106
107	7	DRIVE1	80A	4.8KW	A	4.8KW	80A	DRIVE2	8	108
109	9	DRIVE1		4.8KW	B	4.8KW		DRIVE2	10	110
111	11	DRIVE1		4.8KW	C	4.8KW		DRIVE2	12	112
113	13	INDOOR LIGHT	15A	220W	A	0	NA	SPARE	14	114
115	15	OUTDOOR LIGHT	15A	250W	B	0	NA	SPARE	16	116
117	17	SPARE	NA	0	C	0	NA	SPARE	18	118
119	19	SPARE	NA	0	A	0	NA	SPARE	20	120
121	21	SPARE	NA	0	B	0	NA	SPARE	22	122
123	23	SPARE	NA	0	C	0	NA	SPARE	24	124
125	25	SPARE	NA	0	A	0	NA	SPARE	26	126
127	27	SPARE	NA	0	B	0	NA	SPARE	28	128
129	29	SPARE	NA	0	C	0	NA	SPARE	30	130

ELECTRICAL PANEL 2, 50AMP MAIN BREAKER, 208/120V, AIC RATING 10,000A										
WIRE	POSITION	CIRCUIT	BREAKER SIZE	ESTIMATED LOAD	PHASE	ESTIMATED LOAD	BREAKER SIZE	CIRCUIT	POSITION	WIRE
2012	1	INDOOR OUTLETS	20A	500W	A	1500W	25A	HEATER	2	202
203	3	OUTDOOR OUTLETS	20A	500W	B	1500W		HEATER	4	204
205	5	PLC PANEL	20A	500W	C	100W	15A	EXHAUST FAN	6	206
207	7	SPARE	NA	0	A	D	NA	SPARE	8	208
209	9	SPARE	NA	0	B	0	NA	SPARE	10	210
211	11	SPARE	NA	0	C	0	NA	SPARE	12	212
213	13	SPARE	NA	0	A	0	NA	SPARE	14	214
215	15	SPARE	NA	0	B	0	NA	SPARE	16	216
217	17	SPARE	NA	0	C	0	NA	SPARE	18	218

REGISTERED PROFESSIONAL ENGINEER
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JULY 9, 2011
JAMES G. PALLO
EXPIRATION DATE: 12/31/12

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File: BASE MAP | Project No: 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

ELECTRICAL DISTRIBUTION PANELS

Sheet No: E4
Date: 1/29/2011
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NOTES:

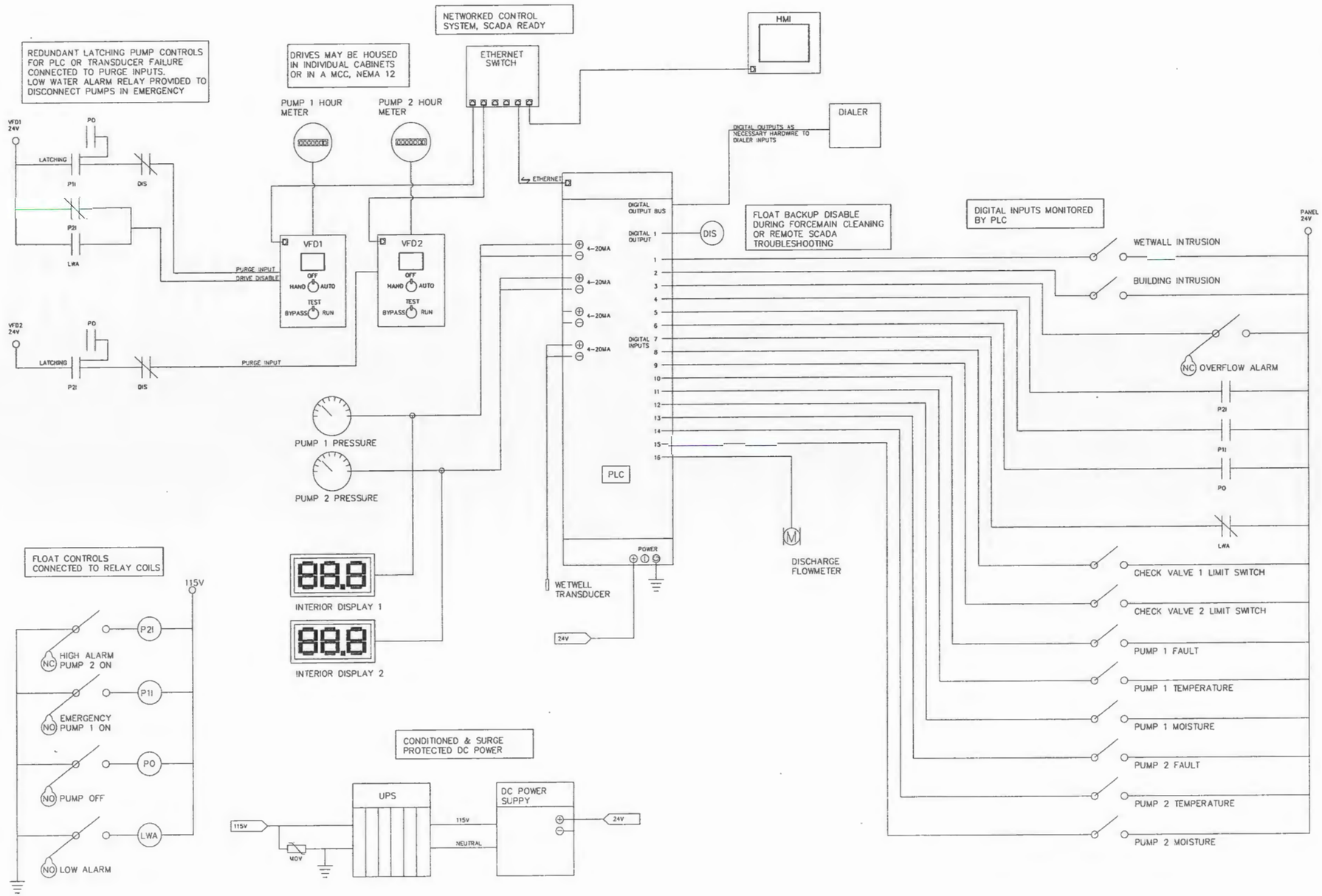
1. IN NORMAL WATER OPERATING RANGE MOTOR DRIVES RECEIVE LOW SIGNAL INTO PURGE INPUT. IF EMERGENCY FLOATS ARE REACHED SIGNAL CHANGES TO HIGH AND MANUALLY RUNS DRIVES

2. DIS (DISABLE) IS PROVIDED TO ALLOW PLC TO MANUALLY OVERRIDE EMERGENCY FLOATS FOR TESTING AND FORCEMAIN CLEANING.

3. THE DRIVE DISABLE REMOVES THE DRIVE OPERATING JUMPER AND CONNECTS TO TWO RELAYS. THE LWA (LOW WATER ALARM) RELAYS WILL REMOVE THE SIGNAL AND STOP PUMPS. HIGH WATER ALARMS (P3I) ARE USED TO OVERRIDE IF THERE IS A CONFLICT BETWEEN FLOATS AND RESTART THE PUMPS.

4. LATCHING RELAYS, PUMP CONTROLLERS, OR TWO RELAYS CONNECTED TO LATCH ARE UTILIZED TO OPERATE THE PUMPS ON EMERGENCY FLOATS, AND PROVIDE A COMPLETE WETWELL PUMP DOWN BEFORE REMOVING POWER TO PUMPS.

5. NORMALLY CLOSED OR NORMALLY OPEN RELAYS ARE SYNCHRONISED WITH THE NORMALLY OPEN OR NORMALLY CLOSED CONTACT ON THE FLOAT SWITCHES. CERTAIN FLOATS ARE CONFIGURED TO DEFAULT TO A CERTAIN POSITION TO PROTECT STATION IF A COMPONENT BECOMES DEFECTIVE OR CABLE LOSES POWER. CHANGES MUST BE APPROVED BY ENGINEER.



REGISTERED PROFESSIONAL ENGINEER
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JULY 9, 2001
JAMES G. PALLO
EXPIRATION DATE: 12/31/12

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Designed By: JBH
Drawn By: JBH
Checked By: JGP
File: BASE MAP
Project No. 1202-022

CITY OF COOS BAY
500 CENTRAL AVENUE

PUMP STATION NO. 4
REPLACEMENT

CONTROLS SCHEMATIC

Sheet No. E5
Date 1/29/2011
28 of 28

Geotechnical Investigation Report

Wastewater Pump Station 4 Improvement
Coos Bay, OR

Prepared for:

City of Coos Bay

SHN Consulting Engineers & Geologists, Inc.
275 Market Ave.
Coos Bay, OR 97420-2228
541-266-9890

August 2010
609031.110

CONSULTING ENGINEERS & GEOLOGISTS, INC.
275 Market Ave. Coos Bay, OR 97420-2228 • 541-266-9890 • FAX: 541/266-9496 • coosbayinfo@shn-engr.com

Reference: 609031.100

August 23, 2010

Mr. Carl Nolte, City Engineer
City of Coos Bay
500 Central Avenue
Coos Bay, OR 97420-0108

Subject: Geotechnical Investigation Report, Wastewater Pump Station 4 Improvement, Coos Bay, Oregon

Dear Mr. Nolte:

The enclosed report documents the results of our investigations for your proposed project. In the report, we discuss geological and geotechnical site characteristics and risks, and provide specific recommendations for site preparation and grading, design, and construction of foundations for the new pump station and adjoining infrastructure facilities.

Based on the results of our field and laboratory investigations, SHN believes that from a geologic and geotechnical engineering standpoint, the project can be developed as planned, and that the proposed pump station can be supported on spread footings, provided our recommendations are followed, and that the noted conditions and risks are acknowledged.

This report concludes our work on the project in accordance with our current agreement. If you have any questions, please call us at 707-441-8855.

Sincerely,

SHN Consulting Engineers & Geologists, Inc.

REGISTERED PROFESSIONAL ENGINEER 13028 OREGON July 26, 1985 RICHARD W. HANFORD JR.
EXPIRES: 6/30/11

Richard W. Hanford, P.E., G.E.
Senior Geotechnical Engineer

CERTIFIED OREGON SHANE M. BEACH E 2022 ENGINEERING GEOLOGIST

Shane M. Beach, C.E.G.
Project Geologist

RWH:SMB:lms
Enclosure: Report

Reference: 609031.110

Geotechnical Investigation Report

Wastewater Pump Station 4
Coos Bay, OR

Prepared for:

City of Coos Bay

Prepared by:

Consulting Engineers & Geologists, Inc.
275 Market Ave.
Coos Bay, OR 97420-2228
541-266-9890

August 2010

QA/QC: GDS _____

Table of Contents

Appendices

List of Illustrations

Figures **Follows Page**

Tables **Page**

Abbreviations and Acronyms

pcf	pounds per cubic foot
psf	pounds per square foot
ASCE	American Society of Civil Engineers
ASTM	American Society of Testing Materials-International
BGS	Below Ground Surface
BH-#	Bore Hole-number
CPT	Cone Penetrometer Test
CPT-#	Cone Penetrometer Test Boring-number
CSZ	Cascadia Subduction Zone
El.	Elevation
FEMA	Federal Emergency Management Agency
H:V	Horizontal to Vertical
NR	No Reference
O.D.	Outside Dimension
ODOG	Oregon Department of Geology and Mineral Industries
ODSL	Oregon Division of State Lands
OGM	Oregon Department of Geology and Mineral Industries
OGS	Oregon Geological Survey
OSHA	United States Occupational Safety and Health Administration
PVC	Polyvinyl Chloride
SHN	SHN Consulting Engineers & Geologists, Inc.
USGS	United States Geological Survey

1.0 Introduction

This report presents the results of the geotechnical investigation conducted by SHN Consulting Engineers & Geologists, Inc. (SHN) for the construction of a new wastewater lift station (wet well) at the City of Coos Bay Pump Station 4 (Figure 1). Our investigation was limited to an evaluation of subsurface condition at the new lift station site and the gravity sewer line feeding into it.

Pump Station 4 was initially constructed in 1954 and was re-located to its current location along the southern bank of Blossom Gulch Creek in 1973. This facility provides service to a mix of single- and multifamily-residences, Blossom Gulch School, and a few minor commercial structures. The station has become a maintenance and performance nuisance for the City of Coos Bay as a result of effluent overflow.

The current project is intended to upgrade the existing sewage distribution system by replacing Pump Station 4 with a 7-foot diameter, precast or cast-in-place wet well and control building. It also includes installing an 8-inch force main and a 12-inch gravity sewer line. Although construction details are not final, we expect that the foundation for the wet well will be placed at Elevation (El.) -8 and the footings for the control building near El. 15.

The control building will be supported by a perimeter foundation with a concrete slab-on-grade floor founded on structural fill. Structural fill will be imported to elevate the pump house foundation to above the 100-year flood height associated with Blossom Gulch Creek to the south. Fill materials at the site will be supported by 3- to 4-foot high retaining walls.

The new sewer line trenches will be within the right-of-way of South 10th and South 11th Streets, and just beyond the northern wall of the commercial structure at 399 South 10th Street. The gravity line invert will be located at El. 0.24.

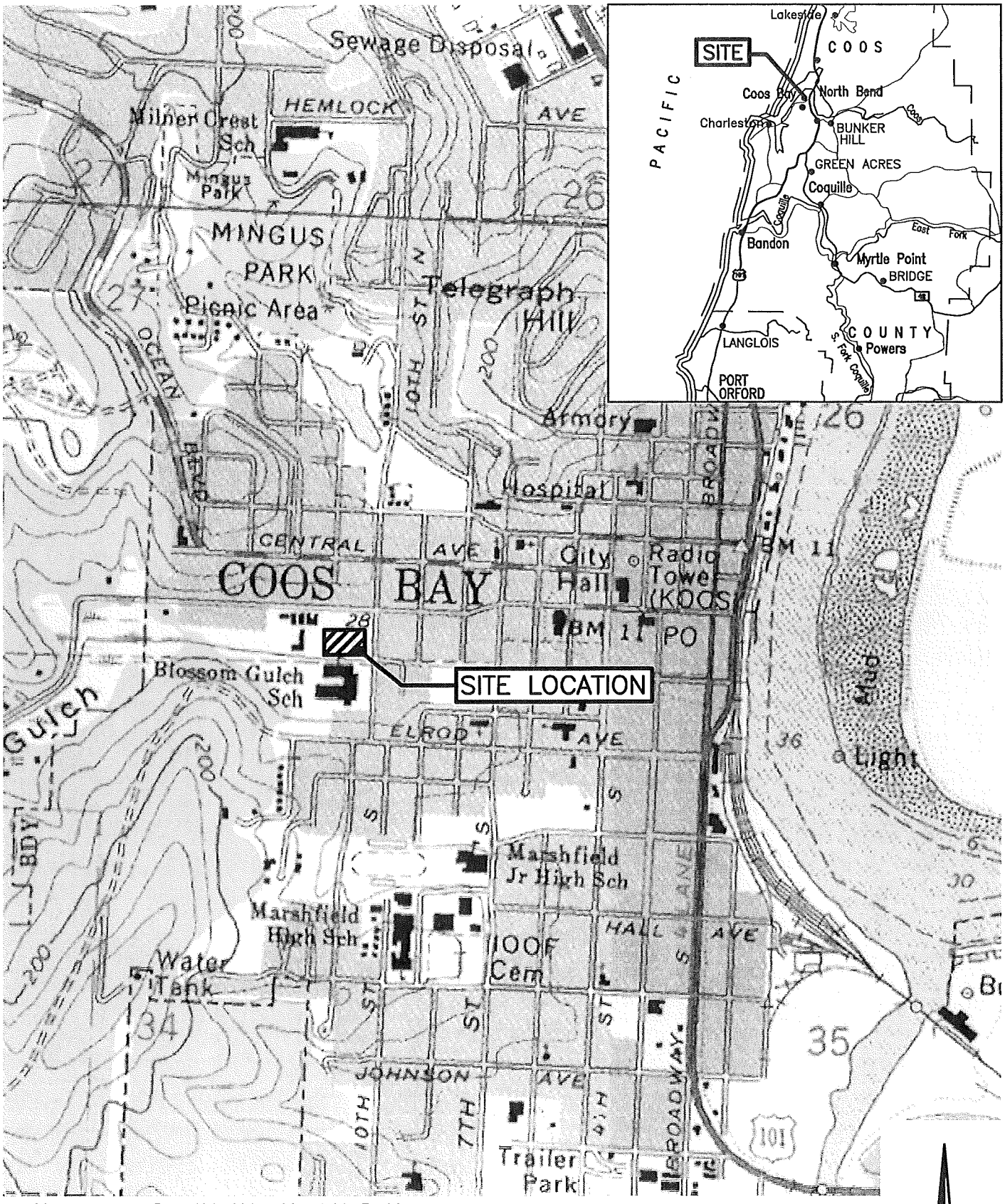
Proposed site improvements that require geotechnical design recommendations include the following:

- Wet Well
- Control Building
- Retaining Wall
- Gravity Sewer Line Trench

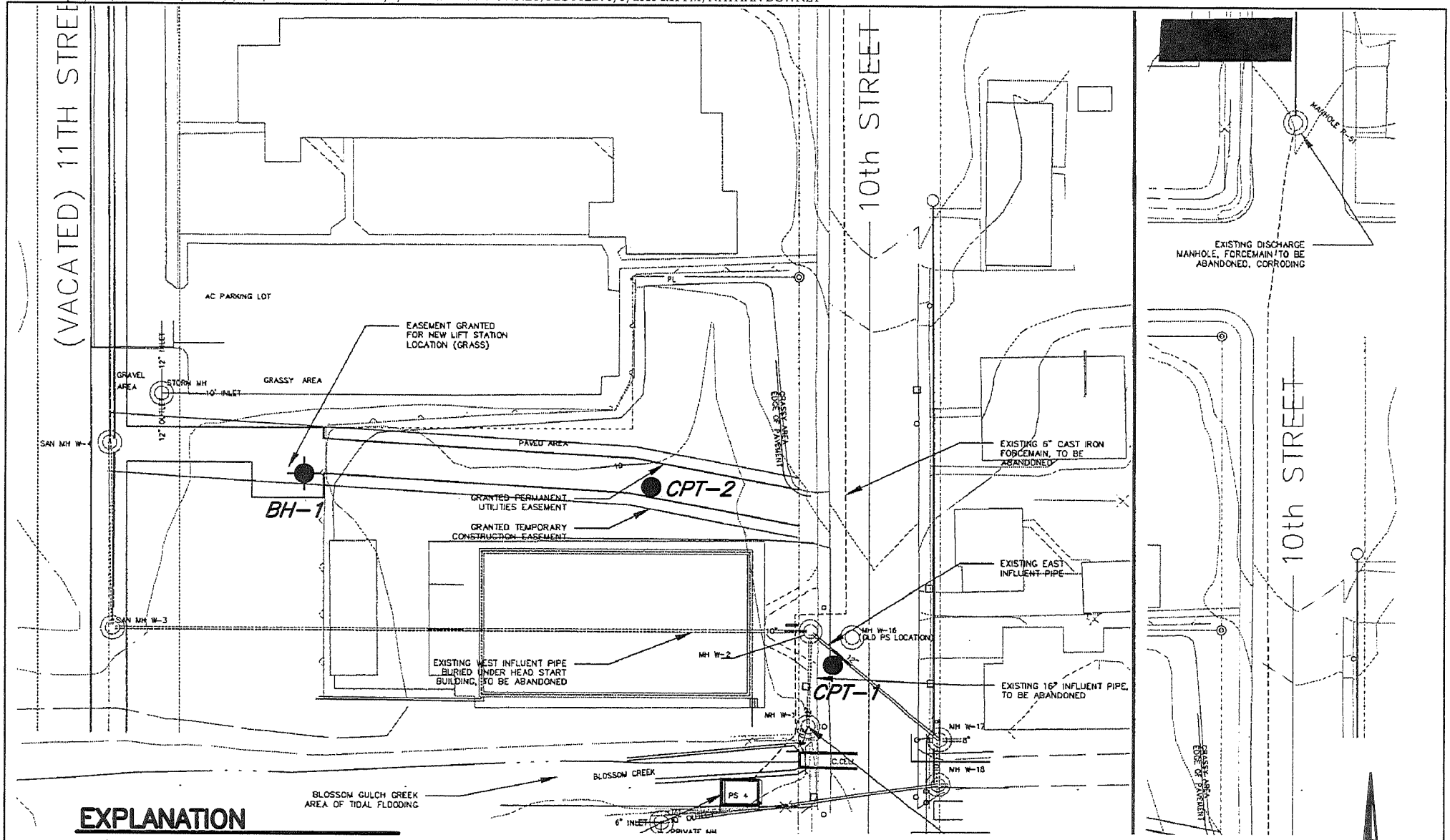
The location and configuration of these project elements are shown on Figure 2. Facility locations are based on those depicted on the "Proposed Site Plan," "Force Main Profile," and "Site Piping" sheets, dated April 10, 2010, provided by Civil West Engineering Services Inc.

2.0 Purpose and Scope of Services

This report is intended to provide the City of Coos Bay staff with findings, conclusions, and recommendations related to the geotechnical aspects of project feasibility, design, and construction. Our investigation was performed to evaluate the surface and subsurface conditions at the site and to develop geotechnical criteria for design and construction of the proposed structure such that it will not contribute or be subject to substantial risk associated with the geologic environment of the site.



Consulting Engineers & Geologists, Inc.	City of Coos Bay Pump Station Replacement Project Coos Bay, Oregon	Site Location Map SHN 609031.110
	August 2010 | 609031-110-LOCATION	Figure 1



EXPLANATION

BH–1 — GEOTECHNICAL BORE HOLE LOCATION AND DESIGNATION

CPT–1 — CONTROL POINT LOCATION AND DESIGNATION

SOURCE: EXISTING SITE DRAWING PREPARED BY CIVIL WEST ENGINEERING, APRIL 13, 2010

SHN Consulting Engineers & Geologists, Inc.	City of Coos Bay Pump Station Replacement Project Coos Bay, Oregon	Site Map with Boring Locations SHN 609031.110
	August 2010	609031-110-SITE	Figure 2

Specifically, the scope of our services consisted of the following tasks:

1. Review selected geotechnical and geological reports and maps pertinent to the project.
2. Perform a geologic reconnaissance of the project area.
3. Supervise the advancement, logging, and sampling a single mechanically drilled boring at the wet well site.
4. Conduct two Cone Penetration Tests (CPTs) along the gravity sewer alignment.
5. Perform geotechnical engineering analyses to develop recommendations for site preparation and grading, compaction requirements for fills and backfills, site drainage, and for design and construction of the proposed wet well foundation.
6. Present a report that includes location and site maps, exploratory mechanical boring and CPT logs, laboratory test data, and our conclusions and recommendations.

The recommendations contained in this report are subject to the limitations presented herein. Attention is directed to the "Construction Phase Monitoring" and "Limitations" sections of this report.

3.0 Field Investigation and Laboratory Testing

A geologist from SHN conducted a field investigation at the subject site on May 14, 2010. We supervised the drilling and sampling of one mechanical boring (BH-1) at the proposed wet well site and conducted two CPTs along the gravity sewer line alignment (CPT-1 and CPT-2). The mechanical boring (BH-1) was advanced to a depth of 31.5 feet Below Ground Surface (BGS) (El. -20.5) using a truck-mounted Mobile B-53 drill rig, equipped with 94 millimeter rotary wash system. CPTs were pushed to a maximum depth of 15 feet BGS (El. -5) using the Mobile B-53. Boring and CPT locations are shown on Figure 2.

Penetration resistance tests were conducted at approximately 5-foot intervals during the advancement of the mechanical boring to the depth explored. The driving system consisted of a 140-pound, 30-inch drop, above-ground, automatic hammer. The observed blow counts (total blows per 6-inch increment, for a total of 18 inches of penetration into the soil) are shown on Field Boring Log BH-1

The following three types of samplers were used during the advancement of the boring:

1. A modified California split spoon sampler with a nominal 3.0 inch Outside Diameter (O.D.)
2. A Shelby thin-walled sampler with nominal 3-inch O.D
3. An SPT split spoon sampler with a 2-inch O.D.

Soils retrieved in the samplers were logged in general accordance with the American Society for Testing and Materials-International (ASTM) protocol. Samples collected from the boring were transported to SHN's certified soils testing laboratory in Eureka, California (soils lab), to determine selected index and strength properties of selected samples. Laboratory testing included in-place moisture content, dry density, and plasticity.

A piezometer was installed in boring BH-1 immediately following its excavation. The piezometer consisted of 1-inch diameter slotted Polyvinyl Chloride (PVC) pipe that extended to a maximum depth of 31 feet BGS. The piezometer was installed with a surface seal to prevent overland flow from infiltrating into the well.

A brief summary of the soil conditions encountered in the investigated portion of the project area is provided in "Section 3.1.3: Subsurface Soils" of this report.

3.1 Site Conditions

3.1.1 General

The proposed lift station will occupy an undeveloped flat along the left bank of Blossom Gulch Creek in Section 26, Township 25 South, Range 13 West of the Coos Bay 7.5-minute quadrangle (latitude 43.366 N; longitude -124.223 W) (Figure 2). The lift station site is located near El. 11, and the parcel on which the gravity sewer line will be installed is located at between El. 8 and El. 10. The proposed sewer line alignment is positioned between 20 and 35 feet away of the foundation of an existing one-story commercial building.

3.1.2 Geology

Published geologic maps of the region (Madin and Mabey, 1996) indicate that surface deposits at the site consist of Holocene age alluvium and estuarine sediments. In the Coos Bay region, these deposits are commonly associated with high groundwater levels and consist of fine sand and elastic silt that can consolidate when surcharged. These soils typically have a soft consistency and exhibit low shear strength.

A filled lands map (Oregon Division of State Lands, 1973) indicates that the project area has been backfilled with artificial fill. The history of fill placement is unknown; however, it is feasible that these materials originated from dredge spoils or from the residential development of surrounding slopes.

3.1.3 Subsurface Soils

Pump Station. Subsurface materials in the proposed foundation area of the new pump station facility consisted of uncontrolled fill and fine-grained estuarine deposits. The soil profile in foundation area can be generalized as:

- Fill: Medium dense sandy gravel (GW) and silty sand (SM), from the ground surface to 10 feet BGS (El. 1)
- Peat (Native): Soft, dark grey organic rich silt (OH) from 10 to 13 feet BGS (El. -2)
- Bay Mud (Native): Soft to medium stiff, dark grey elastic silt (MH) from 13 feet BGS to the depth explored (31.5 feet BGS) (El. -20.5)

Fill material at the site was observed to contain varying amounts of organic material, shells, and concrete and asphalt debris. We are not aware of any documentation that indicated that fill at the site was placed in accordance with current engineering standards (robust mechanical compaction of relatively thin layers of moisture-conditioned soil free of organic and other deleterious materials). This non-engineered, potentially compressible moderate strength material could be susceptible to consolidation settlement under significant loading.

The silt stratum below the fill was found to have a low range of dry density, from 49 to 57 pounds per cubic foot (pcf), owing to the presence of organics and high moisture content. These soils are highly plastic, having a liquid limit of 36.

See the "Field Boring Logs" in Appendix A for detailed soil descriptions, moisture contents, specific contact depths, *in situ* penetration resistance test results, and laboratory index test results.

Gravity Sewer Alignment. CPT exploration near the gravity sewer alignment encountered soft to medium stiff, fine grained soil from the ground surface to the maximum depth explored (El. -5). The low tip pressure (q_c) and sleeve friction (f_s) recorded on the CPT logs suggest that the soil profile consists of clay (CL) and clayey silt (ML). Based on site conditions, we expect that silt and clay recorded in the CPT probes are analogous to the elastic silt (MH, bay mud) encountered in our mechanical boring at the wet well. See the "Field CPT Boring Logs" in Appendix B for specific soil indices.

Groundwater. Detection of groundwater elevations during the advancement of borehole BH-1 was complicated by the use of a rotary wash drilling. A piezometer was, subsequently, installed in the boring to allow for subsequent measurement of groundwater levels. Water elevations were measured in the piezometer in May and June 2010. Groundwater levels were recorded between 6.5 and 7 feet BGS (El. 4.5 to 4) and were tidally influenced.

Our site evaluation was conducted in the early spring season when groundwater levels typically are near their highest. However, during and following periods of heavy precipitation and extreme tides, groundwater levels could be higher than those recorded during our investigation.

3.2 Geologic Hazards

This section of the report is intended to provide the owner with findings, conclusions, and recommendations related to geologic hazards that could potentially impact the proposed reservoir.

3.2.1 Seismic

The project area is bound to the north, south, and west by queried[1] fault traces (Black and Madin, 1995). Although sediments in the Coos Bay region have not experienced seismic deformation historically, late Quaternary deposits and landforms in the area commonly exhibit evidence of folding and faulting. Structural deformation of these deposits and landforms is in response to the onshore encroachment of the Cascadia Subduction Zone's (CSZ's) accretionary prism. None of the faults in the immediate vicinity of the site has been categorized as being capable of producing earthquakes (Madin and Mabey, 1996), and none falls within or directly abuts the anticipated boundaries of this project.

The most significant source of seismic shaking affecting the Coos Bay region is the CSZ, the seaward edge of which is located approximately 60 miles west of the project area. Extending 750 miles from Cape Mendocino, in Northern California, to the Queen Charlotte Islands, in Canada, the CSZ is capable of generating an earthquake event in the magnitude 9 range. The last large subduction event likely occurred about 300 years ago. To date, the only documented CSZ earthquake was the April 25, 1992, magnitude 7.1 event, with its epicenter located near Petrolia,

[1] Fault traces are "queried" where location or existence is uncertain.

California. A great subduction event would generate very strong, long duration ground shaking that could result in significant land level changes (several meters of uplift or subsidence may occur in many coastal areas), and could trigger large-scale co-seismic landsliding.

Based on this information, we conclude that the project area could be subject to strong seismic ground shaking during the design life of the proposed structure. However, the facility is not exposed to any greater seismic risk than other sites in the low land areas in Coos Bay.

3.2.2 Liquefaction

Liquefaction is described as the sudden loss of soil shear strength due to a rapid increase of soil pore water pressure caused by cyclic loading from a seismic event. In simple terms, it means that a liquefied soil acts more like a fluid than a solid when shaken during an earthquake. In order for liquefaction to occur, the following are needed:

- granular soils (sand, silty sand, sandy silt, and some gravel),
- a high groundwater table, and
- a low density granular soil (usually associated with young geologic age).

The adverse effects of liquefaction include local and regional ground settlement, ground cracking, expulsion of water and sand, and the partial or complete loss of bearing and confining forces used to support loads.

At this site, relatively young, partially consolidated, fine-grain sediments (bay muds) are present below the seasonal groundwater table (refer to Field Boring Logs). Laboratory analysis indicates that native bay muds underlying the site can have plastic indices in excess of 33 with a fine content of 97%. Boulanger and Idriss (2006) state that fine-grain sediment (such as, at this site) can be expected to exhibit clay-like behavior, and consequently should not be susceptible to liquefaction or related soil behaviors.

Liquefaction, co-seismic settlement, and lateral spreading in the project area are considered negligible risks for earthquakes of small to moderate magnitude. In relatively rare, great earthquakes, for example those with a moment magnitude of 7.5 or greater, there may be some risk of co-seismic settlement, and lateral spreading along Blossom Gulch Creek. Risk of damage to the proposed structure from these soil behaviors, if they occur, is considered likely to be within building code criteria for upper bound (rare, great) earthquakes. Liquefaction is, therefore, considered a low risk during relatively rare, great earthquakes, due to the highly plastic nature of the soils at the site.

3.2.3 Slope Stability

During our site investigation, we did not observe any evidence that the slopes around the existing facility or in the areas proposed for expansion had experienced mass movements recently or in the distant past. In general, the slopes proposed for development are devoid of landslide morphology. Therefore, the risk of native slope failures at or adjacent to the proposed project is considered to be negligible. It is our professional opinion that no slope failure mitigation measures are required for this project.

3.2.4 Flooding

According to the Federal Emergency Management Agency (FEMA) maps, the proposed building site is located within the special flood hazard area for Blossom Gulch Creek. The project engineer proposes to mitigate this hazard by raising the site grade and placing the control building foundation at El. 15, outside the 100-year flood zone.

3.2.5 Tsunami

The project area is located just over a half-mile inland of the western margin of Coos Bay at about El. 11. The "Tsunami Hazard Map of the Coos Bay Quadrangle" (Priest, 1995) indicates that a tsunami triggered by a magnitude 8.8 undersea earthquake will extend inland less than 200 feet beyond the mean high tide mark near the intersection of Anderson Avenue and Highway 101 (approximately 2,400 feet to the east). Consequently, the risk of the project area being inundated by a tsunami wave is considered negligible; therefore, no special mitigation measures are required.

4.0 Conclusions and Recommendations Relative to Geohazards

This section of the report is intended to provide the City Staff with findings, conclusions, and recommendations related to geologic aspects of project design and construction.

Based on the results of our field investigations, SHN believes that the site can be developed as planned without being subject to or contributing to geologic hazards, provided our recommendations are followed and that the noted conditions and risks are acknowledged.

1. Strong seismic shaking should be anticipated for the project lot within the design life of the structures. We recommend that the proposed facility be designed to withstand strong seismic shaking. The minimum standard for construction of the structure should be in accordance with the latest edition of the Oregon Structural Specialty Code for the most seismically active areas. Seismic design recommendations are provided in Section 5.1.1.
2. The project area is not subject to landslide hazards.
3. The project area is subject to flooding hazards. These hazards are to be mitigated by the project engineer by artificially raising the building area above the 100-year flood zone.
4. The site is not subject to hazards associated with liquefaction for earthquakes of small to moderate magnitude. During relatively rare, great earthquakes, risk of damage to the proposed structures from soil behavior associated with liquefaction, should they occur, is considered likely to be within building code criteria.
5. The risk of co-seismic differential settlement to the proposed facilities is considered to be low provided proper foundation systems are constructed.
6. The risk of the project area being inundated by a tsunami wave is negligible.

5.0 Geotechnical/Soils Engineering

The following factors contribute to the design recommendations that follow:

1. Engineering properties of the existing fill within the upper 10 feet at the new wet well and control building are variable, but have stronger apparent shear strength than the underlying soft soil (bay muds) below a depth of 10 feet BGS. Any new structures on uncontrolled fill or fill that has no documented degree of compaction reported may be subject to differential settlement from additional loading.
2. Organic silt and underlying high-plasticity silt below a depth of 10 feet BGS will consolidate when additional loads are applied. Raising the site grade and placing a structure over these compressible soils will cause consolidation settlement to occur. Data obtained from our field investigation indicates that some of the subsurface materials in the project area have low densities and could be subject to consolidation when excess loads are applied. Our site evaluation also indicates that shallow groundwater conditions are likely to be encountered during the installation of the wet well and gravity feed sewer line.
3. High groundwater and soft soil will require lateral bracing or shoring to support temporary excavations to install underground utilities. Sloped excavations are impractical given site conditions.

To install the wet well, more than 18 feet of existing material will be excavated. Unloading the site is favorable for the installation of the new wet well in that it will result a decrease in overburden loads.

Based on the results of our field and laboratory investigations, it is our opinion that geotechnical engineering conditions are favorable and the proposed wet well and adjoining facilities can be constructed on the site as planned. This assumes that the recommendations contained in this memorandum are incorporated into the design and construction of the project and that noted conditions and risks are acknowledged.

5.1 General Engineering Design Recommendations

5.1.1 Seismic Design

Based on a soil Site Class E (soft soil profile), Occupancy Category II and a latitude and longitude of 43.366 N and -124.223 W, respectively, we calculated design spectral response acceleration parameters for the project area. We used the United States Geological Survey (USGS) seismic calculator software program, "Seismic Hazard Curves, Response Parameters, Design Parameters: Seismic Hazard Curves, and Uniform Hazard Response Spectra, v. 5.0.9," dated October 6, 2008 to calculate seismic design criteria.

Table 1
Seismic Design Criteria for Lift Station No. 4, Coos Bay, OR

S_S	1.500
S_1	0.718
F_a	0.9
F_v	2.4
S_{MS}	1.350
S_{M1}	1.724
S_{DS}	0.900
S_{D1}	1.150
Seismic Design Category	D

5.1.2 Excavation Characteristics

Based on laboratory test results and drilling effort, conventional heavy excavation machinery should be able to excavate through the fill and underlying native sediments present in the proposed foundation area and along the proposed pipeline alignment. Woody debris may be

present and could require special excavation means, methods, or equipment. Groundwater was measured at a depth of 6.5 feet in the boring. Soil below groundwater elevation is expected to be soft and wet; slumping of sidewalls should be expected unless shoring is incorporated.

5.1.3 Structural Fill and Placement Criteria

If the wet well is constructed in an open excavation or is laterally supported by a temporary excavation support system, backfill around the structure should meet the following requirements:

- Structural fill should consist of granular material containing no organic material, debris, and no individual particles larger than 6 inches across. The fines content, those soils that pass the No. 200 sieve, should not exceed 5 percent.
- If gravel is used, it should be well-graded to include a variety of particle sizes to minimize relatively large void spaces, into which fine grained soils can migrate. We suggest the use of well-graded granular soils (gravel) for fill, because these soils are relatively easy to moisture condition and compact.
- Bay mud encountered below a depth of 10 feet BGS in the boring and excavated from the site is not suitable for re-use structural fill.
- Existing fill material above a depth of 10 feet BGS in the boring is suitable for use as structural fill, provided it meets the above criteria for structural fill.

Structural fill should be placed symmetrically on each side of the wet well facility during backfilling. Structural fill should be placed to design grades in thin lifts of less than 8 inches of loose thickness and compacted to a minimum of 90% of the maximum dry density as determined by the current ASTM D1557 test method. To avoid settlement, backfill should not be under compacted. To avoid excess pressure against the wet well walls, backfill should not be over compacted.

5.1.4 Temporary Excavation Support

Temporary cut slopes excavated into Type C soils may be impractical at this site where excavations exceed a depth of 10 feet, due to soft soil and shallow groundwater (depth of 6.5 feet at the time of our investigation). Temporary cut slopes within the fill in the upper 10 feet should be excavated at a gradient no steeper than 1.5:1 (Horizontal to Vertical [H:V]) without the installation of appropriate shoring systems. Flatter cut slopes (2:1 H:V) may be required, depending on the actual conditions encountered, particularly where seepage is encountered. Saturated, unconsolidated fill sediments at the site could heave (run) if exposed in excavation sidewalls experiencing high water levels. If soil conditions begin to degrade, remedial procedures may have to be implemented quickly to stabilize the cut slope. It may be necessary to stop or slow the excavation temporarily to allow time for water to drain from the groundmass behind the exposed cut slope face to reduce risk of slope instability during construction.

Construction-phase monitoring should include close observation for indications of perched or high groundwater conditions, which could adversely affect temporary cut-slope stability. The nature of the soil materials exposed in the cut-slope excavations; the location of the groundwater table; and any evidence of creep, ground cracking, or incipient landsliding should be closely monitored until backfill operations begin.

Temporary shoring systems are a more likely approach to excavation support and should be designed by a professional engineer licensed in the State of Oregon. All applicable local, state, and federal safety codes should be followed. For design, the engineering parameters given in Table 2 are appropriate.

Table 2
Engineering Properties for Temporary Excavation Support Design

Soil Type and Depth	Dry Unit Weight	Wet unit Weight	Angle of Internal Friction	Cohesion	At-rest Equivalent Fluid Pressure	Passive Equivalent Fluid Pressure
Fill, 1 – 10 feet	108 pcf[1]	125 pcf	30°	0	65 pcf	375 pcf
Organic silt and silt below a depth of 10 feet	55 pcf	90 pcf (28 pcf buoyant)	18°	350 psf[2]	60 pcf 20 pcf (buoyant)	170 pcf 55 pcf (buoyant)

1. pcf: pounds per cubic foot
2. psf: pounds per square foot

Construction equipment, stockpile materials, and vehicle traffic surcharge loads on the excavation support system should be included in the design.

Configuration of excavations and design of temporary support systems are the responsibility of the contractor, and should be reviewed by the project geotechnical engineer.

5.2 Specific Geotechnical Engineering Recommendations

5.2.1 Wet Well

Settlement. Unless additional loads are applied to the surface at the wet well, settlement should be negligible. The weight of the soil excavated for the wet well should be compensated by the foundation and the effects of buoyancy. There is a low probability that the lightly loaded structure proposed for installation below grade will exceed existing overburden pressures.

Foundation The foundation mat for the wet well is expected to be situated at El. -8 and founded on at least 12 inches of gravel base overlying native highly plastic silt (MH, bay mud) as encountered in the boring. The foundation mat should be designed so that it does not apply bearing pressures in excess of 3,000 pounds per square foot (psf) for dead load plus live loads. The allowable bearing pressure may be increased by one-third to account for the short-term effects of seismic loading. The allowable bearing capacity takes into consideration water being present at the base of the foundation slab and uplift should be included in design.

Lateral Earth Pressure: Lateral forces (such as, earthquake loading) may be resisted by friction along the base of the wet well mat, provided it is underlain by an aggregate base at least 12 inches thick. An allowable sliding friction coefficient of 0.40 may be used for the contact between concrete and the aggregate base. Additional lateral resistance may be calculated for short-term loadings by allowable lateral passive pressure represented by an equivalent fluid weighing 170 pcf, where footings bear laterally against the soft native soil after removing the temporary excavation support system (that is, sheet piles). Where at least 18 inches of structural granular fill is placed between the edge of the footing and sidewalls (sheet pile wall), an equivalent fluid pressure of 275 pcf may be used.

Dewatering: Groundwater was encountered in the boring at a depth of 6.5 feet below existing grade. These groundwater conditions could cause lateral movement of the soils into excavations or cause excessive ground settlement adjacent to the excavations. Ideally, the project should occur during the late summer/early fall season, when groundwater levels typically are at their lowest.

Groundwater should be drawn down at least 3 feet below the base of any open cut excavation so that a suitably stable base is provided for construction. If a watertight sheet pile excavation is planned, the depth of embedment of the sheets should extend at least 10 feet below the bottom of the concrete wet well mat. Potential adverse effects of groundwater drawdown on adjacent structures should be considered. Silt below a depth of 10 feet at the site has the potential to undergo consolidation due to dewatering. Minor settlement of the silt and overlying fill material should be anticipated if the groundwater elevation is reduced.

Dewatering systems should be installed and functioning prior to the beginning of excavation. Design of the dewatering system should include provisions for disposal of collected water in accordance with applicable regulations. Constructors should develop a management system that can deal with groundwater inflow from the excavation sidewalls. Constructors may assume that in-trench pumping operations will be adequate. Care must be taken to provide the correct filtering around the dewater wells to prevent the migration of fines and the loss of ground around the wet well.

Buoyancy. The wet well will extend below the groundwater table, measured in the boring at 6.5 feet below existing grade, and will be subject to buoyancy and uplift. Resistance to uplift can be developed by the dead weight of the proposed structure and friction along its sides, provided at least 18 inches of granular structural fill is placed between the excavation support system and the wet well. Total frictional resistance can be calculated using an apparent adhesion of 10 psf multiplied by the surface area of the wet well.

5.2.2 Control Building

Site Grading. It is understood that as much as 4 feet of fill may be placed to raise the site grade to accommodate the new control building. The existing grass surface should be stripped of surface debris and vegetation to a depth of at least 6 inches. Stripping should extend out 3 feet beyond the perimeter of areas proposed for foundation support. If present, major root systems within 5 feet of the building perimeter should be removed.

If the exposed surface is firm and unyielding after stripping, structural fill may be placed to the new site grade. If a yielding surface is observed (pumping, weaving under wheel loads), additionally excavate the yielding area, and replace the over-excavated material with angular gravel, sand or aggregate, in a manner that will result in a stable subgrade surface.

Settlement Potential. Fill that is placed to elevate the building pad will result in additional settlement. The organic silt and plastic silt at least 14 feet below the pad grade will experience some compression due to the additional surcharge, probably less than 2 inches. Most of the estimated settlement will occur within the first two months after the fill is placed. Therefore, it will be advantageous to delay construction of the control building as long as is practicable. Unless the fill within the upper 10 feet is more compressible than we estimated, post-construction settlement is not likely to exceed 1 inch. Because of the potential for differential settlement due to undocumented fill and raising the site grade, we recommend that the control building be supported on a mat foundation.

Foundations. A mat foundation tied to perimeter footings (thickened slabs) should be designed to mitigate potential differential settlement. The potential for differential settlement exists because the new structure will be supported on as much as 10 feet of existing fill underlain by compressible soil.

We recommend a minimum granular base thickness of 6 inches, compacted to at least 95% of the maximum dry density in accordance with ASTM D1557. Structural fill will be exposed at the subgrade elevation overlain by at least 6 inches of aggregate base. Therefore, a subgrade modulus of 180 pounds per square inch can be used for design of the mat foundation. This subgrade modulus value is one that would be obtained in a standard *in situ* 1-foot square plate test where 1 inch of deflection is recorded.

Lateral forces may be resisted by friction along the base of the mat foundation that is supported on structural fill. An allowable sliding friction coefficient of 0.35 may be used. The mat foundation will be thickened on the edges to support the building walls. Therefore, any contribution of passive resistance should be neglected. A 20 percent increase in sliding friction may be assumed for temporary loading (wind, seismic) conditions.

The ground surface should be sloped away from the proposed structure, or other design measures should be implemented to provide positive surface water drainage away from the perimeter foundation. The ground surface should not exceed a gradient of 10%, however, for a distance of at least 5 feet beyond the perimeter of the proposed facility.

5.2.3 Retaining Structures

Retaining walls are planned to support the fill that is to be placed to raise the site grade for the control building. We assume the retaining walls will support structural fill. Free-standing retaining walls should be designed for active earth pressures, using an equivalent fluid pressure of 35 pcf for horizontal backfill, plus 2 pcf for every 5-degree increase in slope of backfill behind the wall. Where vehicle traffic is allowed within 5 feet from the top of the wall, an additional surcharge of 100 psf should be included in the design.

Retaining wall foundations should be designed using an allowable bearing capacity of 1,500 psf. This is comparatively low and is due to their support on apparently competent, but uncontrolled fill. The foundation depth should be at least 18 inches below the lowest adjacent grade.

The design active pressures presented above are predicated on positive drainage being provided behind the retaining walls, to mitigate the potential for hydrostatic pressure build-up. Retaining walls should be provided with permanent drains to prevent the build-up of hydrostatic pressure. The drains should consist of continuous blankets of free-draining rock with collector pipes that drain to exterior outlets.

Select backfill behind retaining walls should be placed in thin lifts and compacted to at least 90% relative compaction. Light compaction equipment should be used to avoid overstressing the walls. Retaining walls will yield slightly during backfilling; therefore, walls should be backfilled prior to building on or adjacent to the walls.

5.2.5 Gravity Feed Sewer Line Trenches

Wet to saturated bay mud sediments are likely to be encountered during excavation of the gravity feed sewer line trenches. The design grade for the sewer line invert at the wet well is El. -0.25, which will require an excavation of at least 10 feet. In accordance with Occupational Safety and Health Administration (OSHA) regulations, shoring and bracing is not required if trench sidewalls in a type C soil are graded flatter than 1.5:1 (H:V) and the excavations are shallower than 20 feet. However, based on planned excavation depths, anticipated subsurface conditions (bay mud), and site limitations, we expect that temporary shoring systems will be required.

Temporary Shoring. Feasible temporary shoring types include, but are not limited to:

- Moveable shield
- Sheet pile support
- Soldier pile and lagging
- Secant or tangent wall
- Soil nails or tieback anchors
- Steepened temporary slopes

We expect that braced sheet piles will be the most effective temporary excavation support system. Appropriate design criteria are included in Table 1(Page 9).

Dewatering. Refer to the dewatering section ("Section 5.2.1: Wet Well") of this report for design criteria and specifications.

Lateral Earth Pressure: Refer to the lateral earth pressure section ("Section 5.2.1: Wet Well") of this report for design criteria and specifications.

Structural Fill and Placement Criteria: Refer to the structural fill and placement criteria section ("Section 5.1.3: Wet Well") of this report for specifications.

5.3 Construction Phase Monitoring

In order to assess construction conformance with the intent of our recommendations, it is important that a representative of our firm:

- Determine methods for and monitor adequate subgrade preparation.
- Monitor placement of structural fill.
- Monitor foundation excavations.

This construction phase monitoring is important because it will provide the City and SHN the opportunity to verify anticipated site conditions, and recommend appropriate changes in design or construction procedures if site conditions encountered during construction vary from those described in this report. It also allows SHN to recommend appropriate changes in design or construction procedures if construction methods adversely affect the competence of on-site soils to support the structural improvements.

6.0 Additional Services–Plan and Specification Review

We have assumed, in preparing our recommendations, that we will be retained to review those portions of the plans and specifications that pertain to earthwork and foundations. The purpose of

this review is to confirm that our earthwork and foundation recommendations have been properly interpreted and implemented during design. If we are not provided this opportunity for review of the plans and specifications, our recommendations could be misinterpreted.

7.0 Limitations

This report has been prepared for the specific application to the design and construction of the proposed pump station as discussed herein. SHN prepared the findings, conclusions, and recommendations presented herein in accordance with generally accepted geotechnical engineering practices at the time and location that this report was prepared. No other warranty, express or implied, is made.

Soil and rock materials typically are not homogeneous in type, strength, and other geotechnical properties, and can vary between points of observation and exploration. In addition, groundwater and soil moisture conditions can vary seasonally and for other reasons. SHN does not and cannot have a complete knowledge of the subsurface conditions underlying a site. The conclusions and recommendations presented in this report are based upon the findings at the points of exploration, interpolation, and extrapolation of information between and beyond the points of observation, and are subject to confirmation of the conditions revealed by construction. The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be conducted by our firm during the construction phase in order to evaluate compliance with our recommendations.

Findings of this report are valid as of the date of issuance; however, changes in condition of a property can and will occur with the passage of time. If the scope of the proposed construction, including the proposed loads, grades, or structural locations, changes from that described in this report, our recommendations should also be reviewed.

The scope of SHN's geotechnical services did not include assessment for the presence or absence of hazardous/toxic substances in the soil, groundwater, surface water, or atmosphere, or the presence of any environmentally sensitive habitats or culturally significant areas.

8.0 References Cited

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Appendix A

Mechanical Boring Log

Consulting Engineers & Geologists, Inc.

812 West Wabash, Eureka, CA 95501 ph. (707) 441-8855 fax. (707) 441-8877

PROJECT: Blossom Gulch Lift Station No. 4
LOCATION: Proposed Lift Station Site
GROUND SURFACE ELEVATION: ~10 feet
EXCAVATION METHOD: Truck Mounted Mobile B-59
LOGGED BY: SMB

JOB NUMBER: 609031.110
DATE DRILLED: 5/14/10
TOTAL DEPTH OF BORING: 31.5 feet
SAMPLER TYPE: 2.0 & 3.0-inch Split Spoons & 3.0-inch (O.D.) Shelby

BORING NUMBER BH-1

DEPTH (FT)	SAMPLE TYPE	BLOWS PER 0.5'	USCS	PROFILE	DESCRIPTION	% Moisture	Dry Density (pcf)	Unc. Com. (psf)	% Passing 200	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Index	REMARKS
0.0			SM		FILL: SILTY SAND WITH SHELLS, GRAVEL, CONCRETE, AND ASPHALT, medium dense, wet, black to brown							Installed piezometer on 5/14/10.
-1.0												Boring advanced with 94-mm. rotary wash drilling system.
-2.0												
-3.0												
-4.0												Samples driven with automatic hammer.
-5.0		6 7 7				16	109					Hit large concrete block at 5.5 feet BGS.
-6.0	▽											
-7.0												Below Ground Surface (BGS).
-8.0												
-9.0												
-10.0		5 1 1	OH		ORGANIC SILT, soft, wet, black					95	21	
-11.0												
-12.0												Shells in cutting between 11.5 and 15 feet BGS.
-13.0			MH		ELASTIC SILT, soft, wet, dark grey							
-14.0												
-15.0		0 PSI				65.4	57					Direct Shear Test.
-16.0												
-17.0												
-18.0												
-19.0												
-20.0		250 PSI										No sample recovery in Shelby tube, re-sampled with 2.0-inch split spoon.
-21.0												
-22.0		100 PSI				96	46		97.6			
-23.0												
-24.0										78	36	
-25.0												
-26.0		0 PSI				82	49			71	33	Consolidation Test.
-27.0												
-28.0												
-29.0												
-30.0		0 0 0				74	54					
-31.0												
-32.0					Boring halted at 31.5 feet BGS.							
-33.0												

The log and data presented are a simplification of actual conditions encountered at the time of drilling at the drilled location. Subsurface conditions may differ at other locations and with the passage of time.

FIELD LOG

CONSULTING ENGINEERS
& GEOLOGISTS

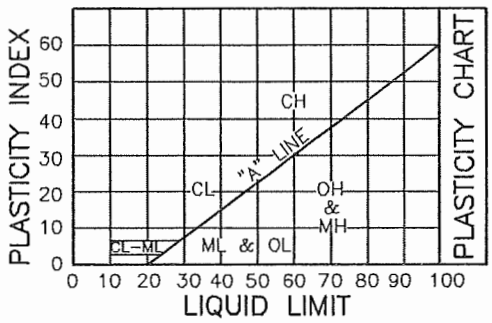
METHOD OF SOIL CLASSIFICATION

MAJOR DIVISIONS		SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN 1/2 OF SOIL >NO. 200 SIEVE SIZE)	GRAVELS (MORE THAN 1/2 OF COARSE FRACTION > NO.4 SIEVE SIZE)	GW	WELL GRADED GRAVELS OR GRAVEL–SAND MIXTURES, LITTLE OR NO FINES
		GP	POORLY GRADED GRAVELS OR GRAVEL–SAND MIXTURES, LITTLE OR NO FINES
		GM	SILTY GRAVELS, GRAVEL–SAND–SILT MIXTURES
		GC	CLAYEY GRAVELS, GRAVEL–SAND–CLAY MIXTURES
	SANDS (MORE THAN 1/2 OF COARSE FRACTION < NO.4 SIEVE SIZE)	SW	WELL GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
		SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES
		SM	SILTY SANDS, SAND–SILT MIXTURES
		SC	CLAYEY SANDS, SAND–CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN 1/2 OF SOIL <NO. 200 SIEVE SIZE)	SILTS & CLAYS LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS & CLAYS LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTY CLAYS, ORGANIC SILTS
HIGHLY ORGANIC SOILS		PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

CLASSIFICATION CHART

CLASSIFICATION	U.S. STANDARD SIEVE SIZE
BOULDERS	ABOVE 12"
COBBLES	12" TO 3"
GRAVEL	3" TO NO. 4
COARSE	3" TO 3/4"
FINE	3/4" TO NO. 4
SAND	NO. 4 TO NO. 200
COARSE	NO. 4 TO NO. 10
MEDIUM	NO. 10 TO NO. 40
FINE	NO. 40 TO NO. 200
SILT & CLAY	BELOW NO. 200

GRAIN SIZE CHART



CONSISTENCY OF FINE GRAINED SOILS		DENSITY OF COARSE GRAINED SOILS	
CLASSIFICATION	COHESION (PSF)	CLASSIFICATION	STANDARD PENETRATION (BLOW COUNT)
VERY SOFT	0–250	VERY LOOSE	0–4
SOFT	250–500	LOOSE	4–10
MEDIUM STIFF	500–1000	MEDIUM	10–30
STIFF	1000–2000	DENSE	30–50
VERY STIFF	2000–4000	VERY DENSE	50+
HARD	4000+		

MOISTURE CLASSIFICATIONS
DRY
DAMP
MOIST
WET

BASED ON UNIFIED SOILS CLASSIFICATION SYSTEM

CONSULTING ENGINEERS
& GEOLOGISTS

BORING LOG KEY

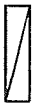
SAMPLE TYPES

DISTURBED SAMPLE (BULK)

HAND DRIVEN TUBE SAMPLE

1.4" I.D. STANDARD PENETRATION TEST SAMPLE (SPT)

2.5" I.D. MODIFIED CALIFORNIA SAMPLE (SOLID WHERE RETAINED)



CORE BARREL SAMPLE (NOT RETAINED)

CORE BARREL SAMPLE (RETAINED)

SYMBOLS

INITIAL WATER LEVEL

STABILIZED WATER LEVEL

– – – – – GRADATIONAL CONTACT

——— WELL DEFINED CONTACT

SS SPLIT SPOON

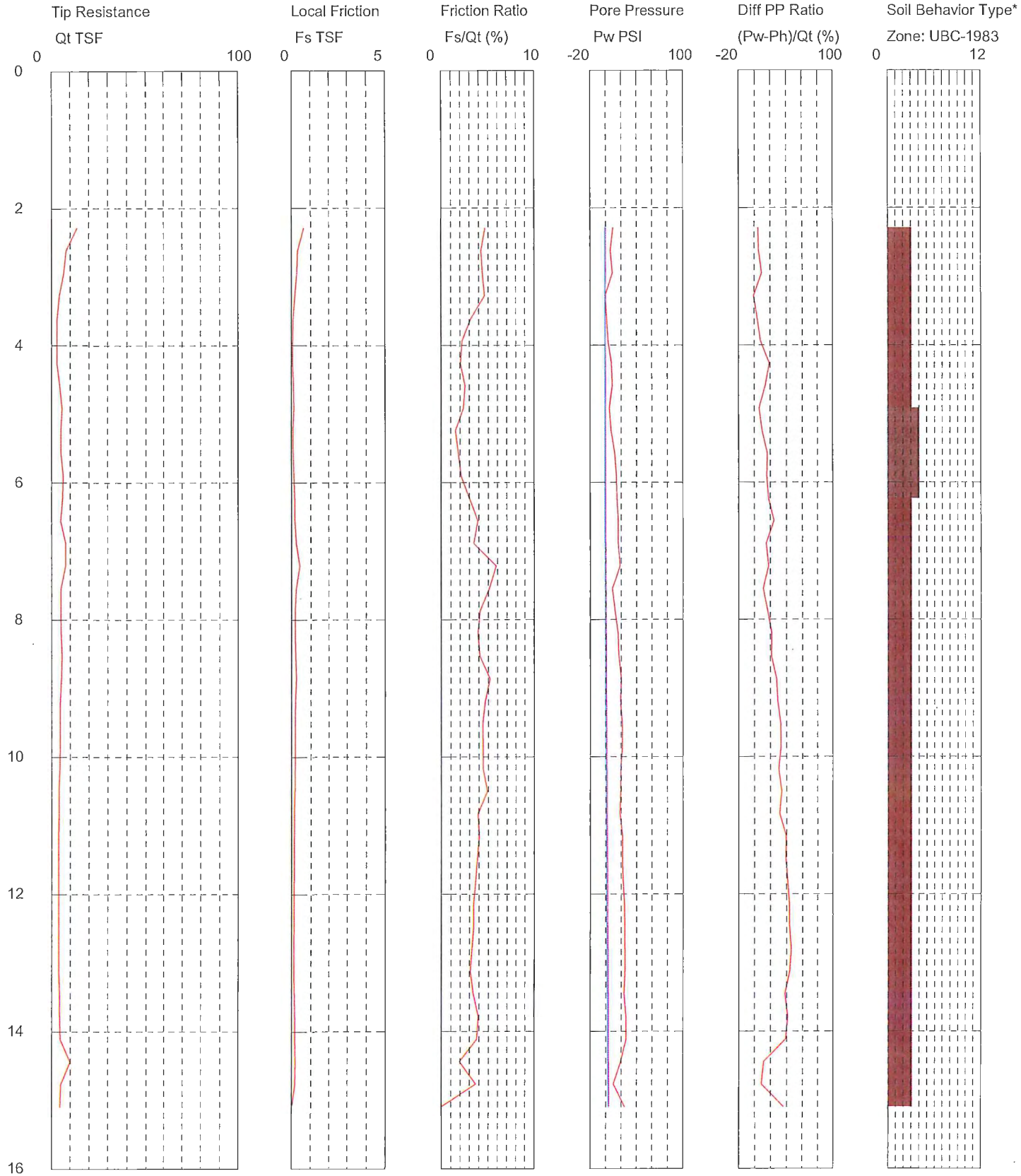
Appendix B

CPT Test Results

Subsurface Technologies

Operator: SAM
Sounding: P-1
Cone Used: DSG1021

CPT Date/Time: 5/14/2010 10:35:54 AM
Location: BLOSSOM GULTCH
Job Number: 609031.110



Maximum Depth = 15.09 feet

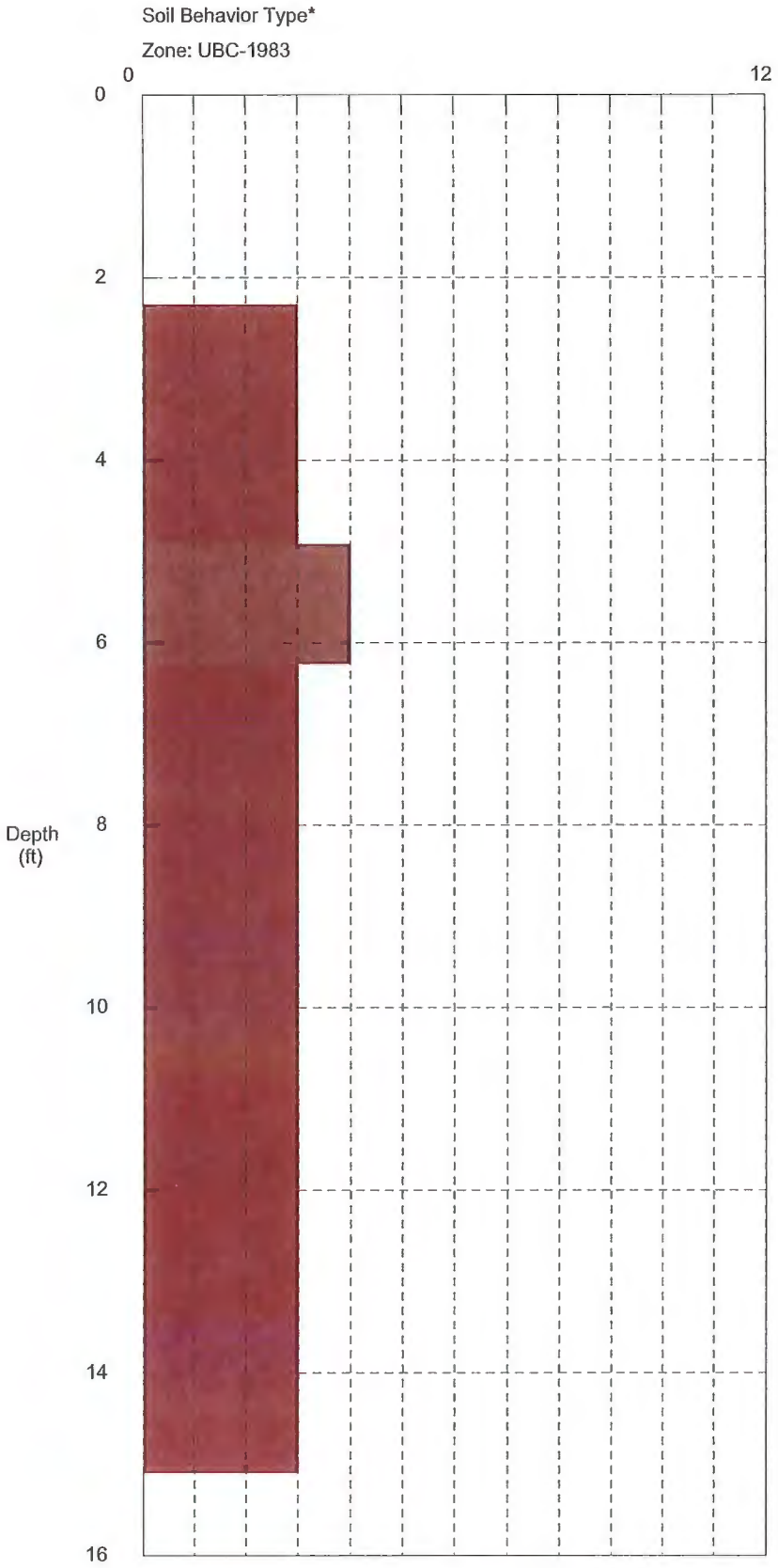
Depth Increment = 0.328 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

Subsurface Technologies

Operator: SAM
Sounding: P-1
Cone Used: DSG1021

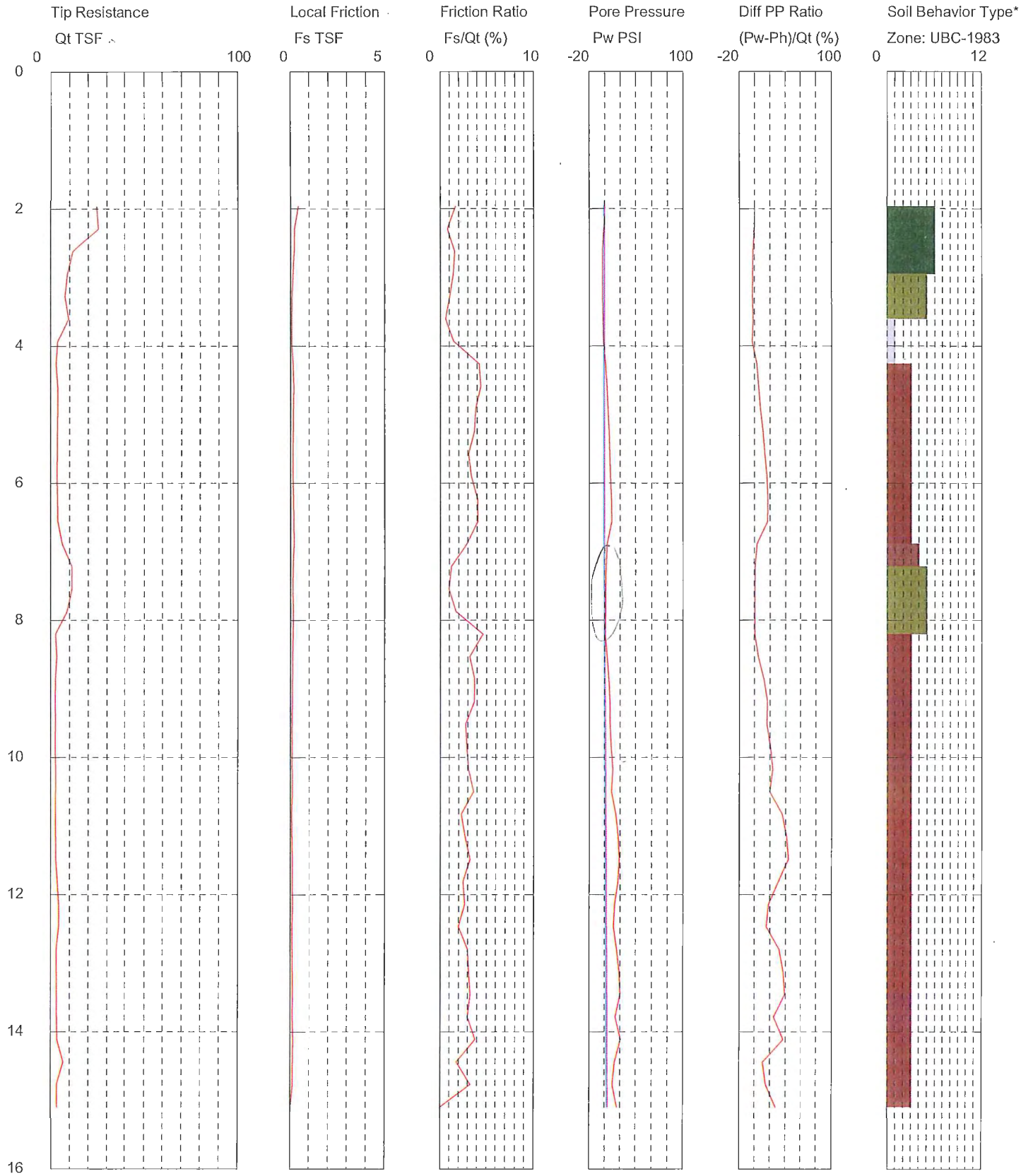
CPT Date/Time: 5/14/2010 10:35:54 AM
Location: BLOSSOM GULTCH
Job Number: 609031.110



Subsurface Technologies

Operator: SAM
Sounding: P-2
Cone Used: DSG1021

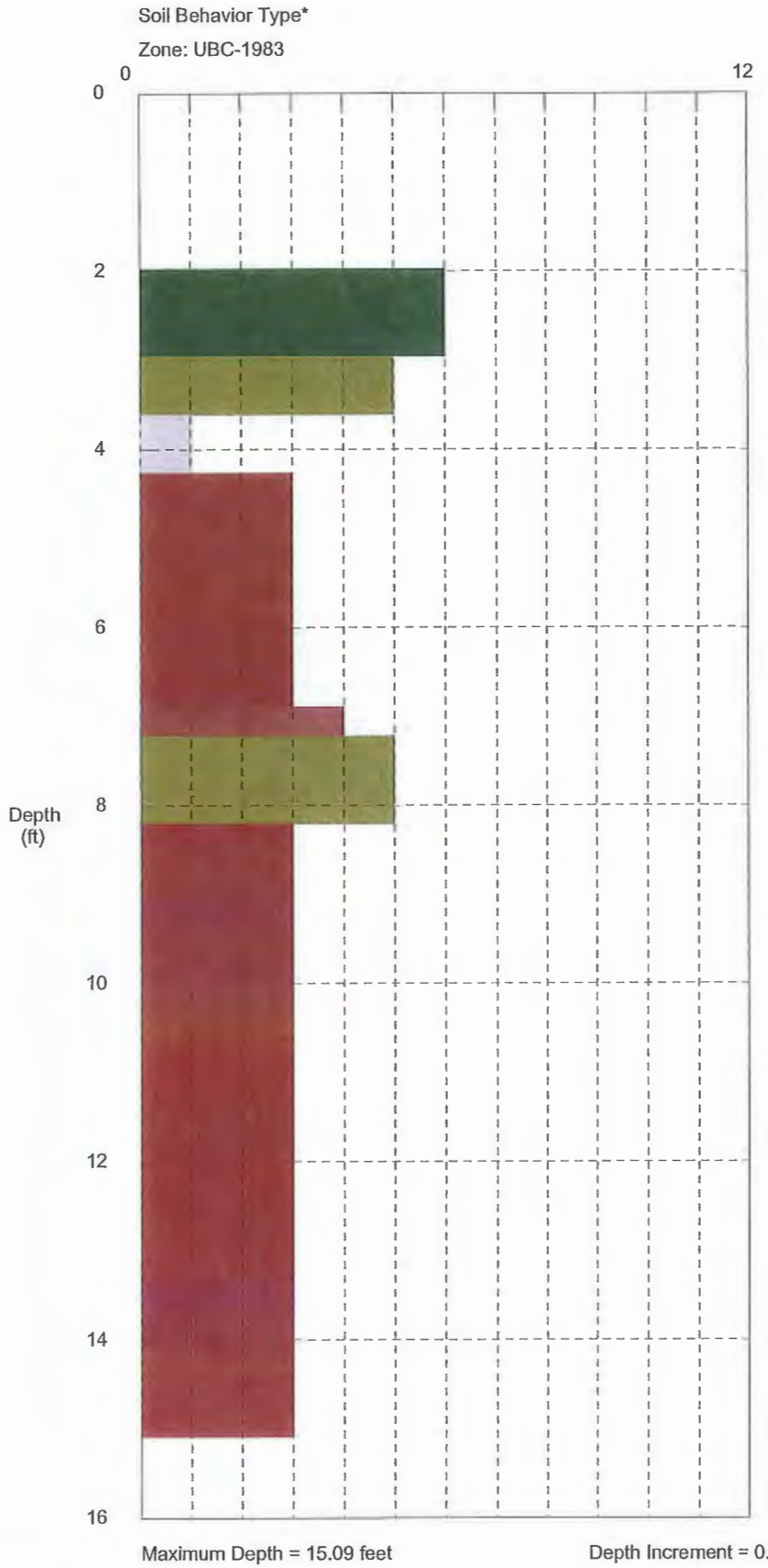
CPT Date/Time: 5/14/2010 11:44:54 AM
Location: BLOSSOM GULTCH
Job Number: 609031.110



Subsurface Technologies

Operator: SAM
Sounding: P-2
Cone Used: DSG1021

CPT Date/Time: 5/14/2010 11:44:54 AM
Location: BLOSSOM GULTCH
Job Number: 609031.110



MS2000-0025
ES 2-7-07

1123 Anderson

GRANTOR: Oregon Regional Behavioral Services
Security Bank Building, Suite 1B
1175 East Main
Medford, OR 97504

GRANTEE: The City of Coos Bay
500 Central Avenue
Coos Bay, OR 97420

After Recording Return to:
City of Coos Bay
Public Works & Developmer
500 Central Ave
Coos Bay, Oregon 97420

CONSIDERATION: Other Value

EASEMENT

Oregon Regional Behavioral Services (the Grantor) does hereby convey to The City of Coos Bay, an Oregon municipal corporation, its successors and assigns (the Grantee), a perpetual nonexclusive easement to be used for the future site of a public sanitary sewer pump station, together with the connecting sewer lines joining said pump station to the existing public sewer system located on the centerline of South Eleventh Street, including maintenance, repair and future construction and/or replacement of said pump station and connecting sewer lines, on, across and under certain real property owned by the Grantor, located in the Southeast quarter of the Southeast quarter of Section 27, Township 25 South, Range 13 West, W.M., Coos County, Oregon, more particularly described as:

> Beginning at the northwest corner of Lot 5, Block M, Western Addition to Marshfield, Coos County, Oregon, thence, south along the west line of Lot 5 a distance of ten (10) feet to the True Point of Beginning; thence west a distance of sixty (60) feet; thence, south a distance of thirty (30) feet to the south line of Lot 5, thence west along the said south line a distance of thirty (30) feet; thence, north a distance of fifteen (15) feet; thence west a distance of sixty (60) feet, to the centerline of vacated South Eleventh Street; thence, north along said centerline a distance of fifteen (15) feet; thence East a distance of thirty (30) feet to the True Point of Beginning.

Be it also conveyed to Grantee by Grantor a fifteen (15) foot wide easement over the existing public storm water and sanitary sewer systems lying within the vacated South Eleventh Street, and the north ten (10) feet of the west sixty (60) feet of Lot 7, Block M, Western Addition to Marshfield; said easement shall be centered over the existing pipelines and structures and be used for the maintenance, repair and future replacement of the public sewer lines.

Grantee shall conform to all applicable laws and regulations of any public authority affecting the subject property, and shall correct at its own expense and failure of compliance created through Grantee's fault or by reason of Grantee's use.

Grantee shall defend, and hold harmless the Grantors from all claims, suits, or actions of any nature whatsoever, including intentional acts, resulting from or arising out

COOS COUNTY CLERK, OREGON TOTAL $36.00 03/08/2007 #2007-3024
TERRI L. TURI, CCC, COUNTY CLERK

of the activities of Grantee, or Grantee's agents or employees acting within the scope of this easement.

Grantee, unless otherwise directed by Grantor, shall, after performing any work pursuant to this easement, restore the property, as nearly as may be practical, to as good a condition as existed before the work was undertaken.

This easement is granted subject to all prior easements and encumbrances of record.

WITNESS our hands this 24 day of January, 2007.

GRANTOR:

OREGON REGIONAL BEHAVIORAL SERVICES
By: Robert C. Beckett, Executive Director

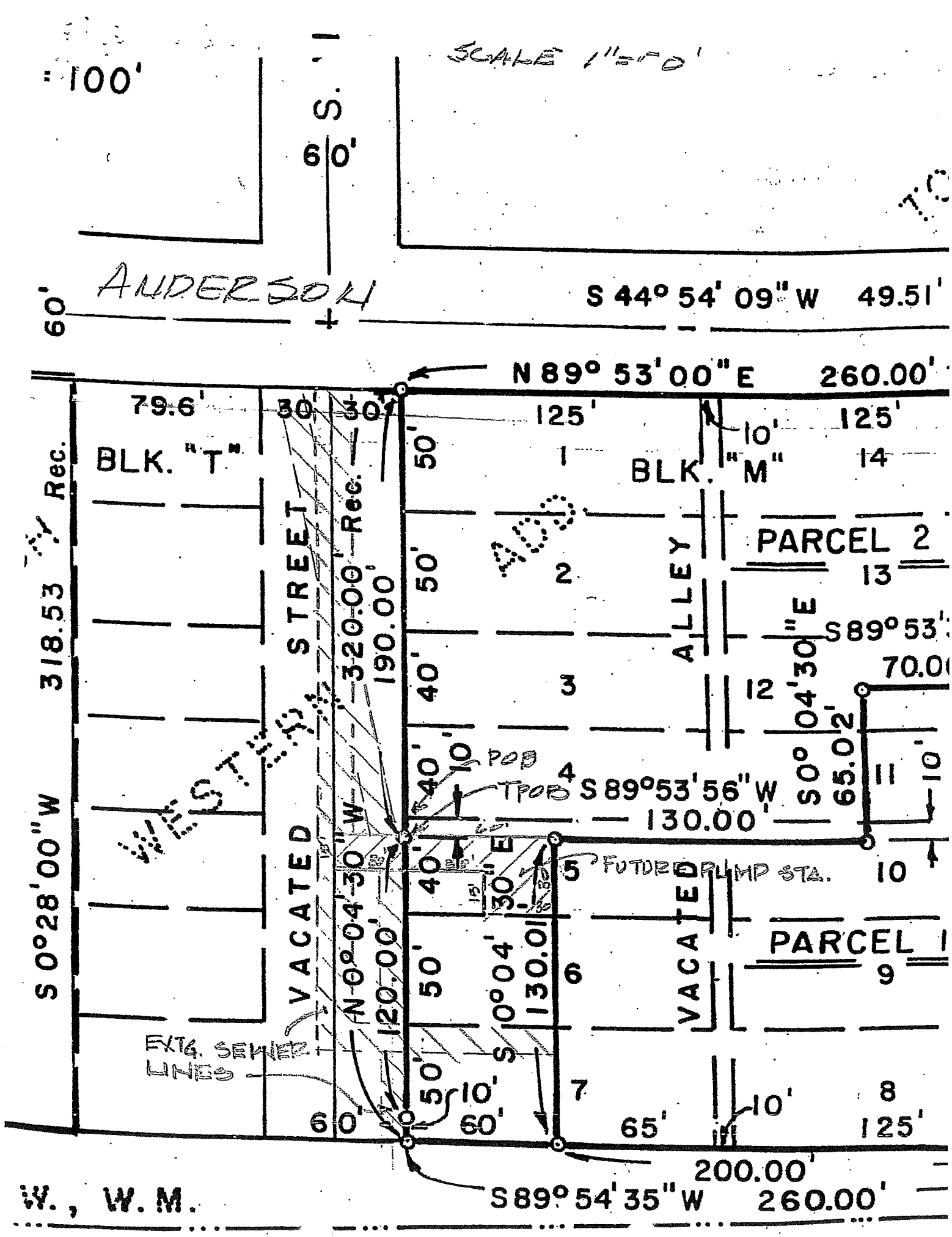
1-24-2007
Date

STATE OF OREGON,)
) ss
County of Jackson.)

OFFICIAL SEAL
MICHELLE GIBSON
NOTARY PUBLIC-OREGON
COMMISSION NO. 404914
MY COMMISSION EXPIRES APR. 13, 2010

Before me on the 24 day of January, 2007, personally appeared the above-named Robert Beckett and acknowledged the foregoing instrument to be his voluntary act and deed.

Michelle Gibson
NOTARY PUBLIC FOR OREGON


SCALE 1"=100'
S.
60'
ANDERSON
60'
S 44° 54' 09" W 49.51'
N 89° 53' 00" E 260.00'
79.6'
30'
30'
125'
125'
10'
BLK. "T"
BLK. "M"
1
14
318.53' Rec.
S 0° 28' 00" W
STREET
VACATED
320.00' Rec.
190.00'
50'
50'
40'
40'
40'
40'
40'
ALLEY
VACATED
PARCEL 2
13
12
11
10
2
3
4
5
6
7
8
9
S 89° 53'
70.0
S 0° 04' 30" E
65.0'
POB
TPOB
S 89° 53' 56" W
130.00'
N 0° 04' 30" W
120.00'
S 0° 04'
130.01'
30'
FUTURE PUMP STA.
PARCEL I
EXTG. SEWER LINES
50'
10'
60'
65'
200.00'
S 89° 54' 35" W 260.00'
W., W.M.
W. W.M.
EASEMENT - 3
TOTAL $26.00

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, PORTLAND DISTRICT
NORTH BEND FIELD OFFICE
2201 N. BROADWAY SUITE C
NORTH BEND, OREGON 97459-2372

REPLY TO
ATTENTION OF:

November 4, 2010

Operations Division
Regulatory Branch
Corps No. NWP-2010-489

Mr. Jim Hossley
City of Coos Bay
Public Works Department
500 Central Avenue
Coos Bay, Oregon 97420

Dear Mr. Hossley:

The U.S. Army Corps of Engineers (Corps) received the City of Coos Bay's (City) request for Department of the Army authorization to construct a new sewer pump station, as shown on Enclosure 1. The project is located between 10th and 11th Streets, near Blossom Gulch Creek in Coos Bay, Coos County, Oregon. The site is located in Section 27, Township 25 South, Range 13 West.

City will construct a new pump station and associated sewage conveyance systems north of Blossom Gulch Creek. A 30-foot by 30-foot section (0.02 acre) will be permanently filled and an area approximately 60 feet by 90 feet (0.12 acre) will be used as a temporary staging area.

This letter verifies that City's project is authorized under the terms and limitations of Nationwide Permit (NWP) No. 12 (Utility Line Activities). City's activities must be conducted in accordance with the conditions found in the Portland District NWP Regional Conditions (Enclosure 2) and the NWP General Conditions (Enclosure 3). City must also comply with the Oregon Department of Land Conservation and Development (DLCD) Coastal Zone Management Concurrence Conditions (Enclosure 4), and the project specific conditions numbered (a) through (g) below. **Failure to comply with any of the listed conditions could result in the Corps initiating an enforcement action.**

a. Permittee shall notify the Regulatory Branch with the date the activities authorized in waters of the U.S. are scheduled to begin. Notification shall be sent by email to cenwp.notify@usace.army.mil or mailed to the following address:

U.S. Army Corps of Engineers
North Bend Field Office
Permit Compliance, Coos County
2201 N. Broadway Suite C
North Bend, Oregon 97459-2372

The subject line of the message shall contain the name of the county in which the project is located followed by the Corps of Engineers permit number.

b. Permittee shall perform all in-water work, including temporary fills or structures, during the in-water work window of July 1 to September 15 to minimize impacts to aquatic species unless coordinated with and subsequently approved by the Corps.

c. Permittee shall clearly flag or mark the limits of the permit or construction boundaries to confine aquatic impacts to those authorized. Flags or markers shall also be installed with a 30-foot setback from the stream. Permittee shall maintain the flags or markers during construction and shall not remove vegetation or operate heavy equipment outside the designated footprint.

d. Permittee shall take the necessary precautions to prevent any petroleum products, chemicals, or deleterious or toxic materials from entering waterways during construction to prevent the introduction of contaminants or pollutants into the aquatic ecosystem.

e. Permittee shall install practicable erosion control devices and maintain good working order of the devices throughout construction to prevent the unauthorized discharge of material into a wetland or tributary and to minimize increases in turbidity resulting from the work. The devices shall be installed in a manner to maximize their effectiveness, *e.g.*, sediment fences shall generally be buried or similarly secured. These devices shall be maintained until permanent erosion controls are in-place or are no longer necessary.

f. Permittee shall re-vegetate areas disturbed at the project site no later than during the earliest appropriate planting season after the authorized work is completed but no later than October 31, 2011. The vegetation shall consist of native, non-invasive herbs.

g. Permittee shall immediately notify the Corps permit issuing office, as found in Special Condition (a) above, and the Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians (CTCLUSI) if at any time during the course of the work authorized, human remains or cultural resources are located within the permit area. We also draw permittee's attention to NWP General Condition 3 (Enclosure 3) which requires City to immediately notify the Corps and the Oregon State Historic Preservation Office if cultural resources are found during construction. he CTCLUSI can be contacted at the following:

Mr. Howard Crombie
Director, Department of Natural Resources
Confederated Tribes of the Coos, Lower Umpqua, and Siuslaw Indians
1245 Fulton Avenue
Coos Bay, Oregon 97420
Office: (541) 888-7511
Fax: (541) 888-2853
HCrombie@CTCLUSI.org

We direct City's attention to NWP General Condition 25 (Enclosure 3) that requires the transfer of this permit if the property is sold, and NWP General Condition 26 that requires City to submit a signed certificate when the work is completed. A "Compliance Certification" is provided (Enclosure 5).

We have prepared a Preliminary Jurisdictional Determination (JD), which is a written indication that wetlands and waterways within City's project area may be waters of the United States (Enclosure 6). Such waters have been treated as jurisdictional waters of the United States for purposes of computation of impacts and compensatory mitigation requirements. If City concur with the findings of the Preliminary JD, please sign it and return it to the letterhead address within two weeks. If City believe the Preliminary JD is inaccurate, an Approved JD maybe requested, which is an official determination regarding the presence or absence of waters of the United States. If City would like an Approved JD, one must be requested prior to starting work within waters of the United States. Once work within waters of the United States has been started, the opportunity to request an Approved JD will no longer be available.

Section 401 Water Quality Certification (WQC) from DEQ has not been issued for this specific action covered under this nationwide permit. Therefore, this authorization will not become valid until the 401 WQC has been received. The 401 certification will be considered by Ms. Corey Saxon, Oregon Department of Environmental Quality, 2020 SW Forth Avenue, Suite 400, Portland, Oregon, 97201-4987. She may be contacted at (503) 229-5051 or via email at saxon.corey@deq.state.or.us. When the approval has been issued, City must provide copies to this office, along with the conditions of the approvals. The conditions of the 401 certification will also be conditions of this authorization. City's activities must be conducted in accordance with those conditions as well as the conditions enclosed with this letter. City's failure to ensure compliance with any of the listed conditions could result in the Corps initiating an enforcement action.

This authorization does not obviate the need to obtain other permits where required. Permits, such as those required from the Oregon Department of State Lands (ODSL) under Oregon's Removal /Fill Law, must also be obtained before work begins.

This verification is valid until the NWP is modified, reissued, or revoked. All of the existing NWPs are scheduled to be modified, reissued, or revoked prior to March 18, 2012. It is incumbent upon City to remain informed of changes to the NWPs. We will issue a Public Notice when the NWPs are reissued. Furthermore, if City commences or under contract to commence this activity before the date the relevant NWP expires, is modified, or revoked, City will have 12 months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this NWP.

We would like to hear about City's experience working with the Portland District, Regulatory Branch. Please complete a customer service survey form at the following address: http://per2.nwp.usace.army.mil/survey.html.

If City has any questions regarding this NWP verification, please contact Kate Groth at the letterhead address, by telephone at (541) 756-2097, or email katharine.c.groth@usace.army.mil.

Sincerely,

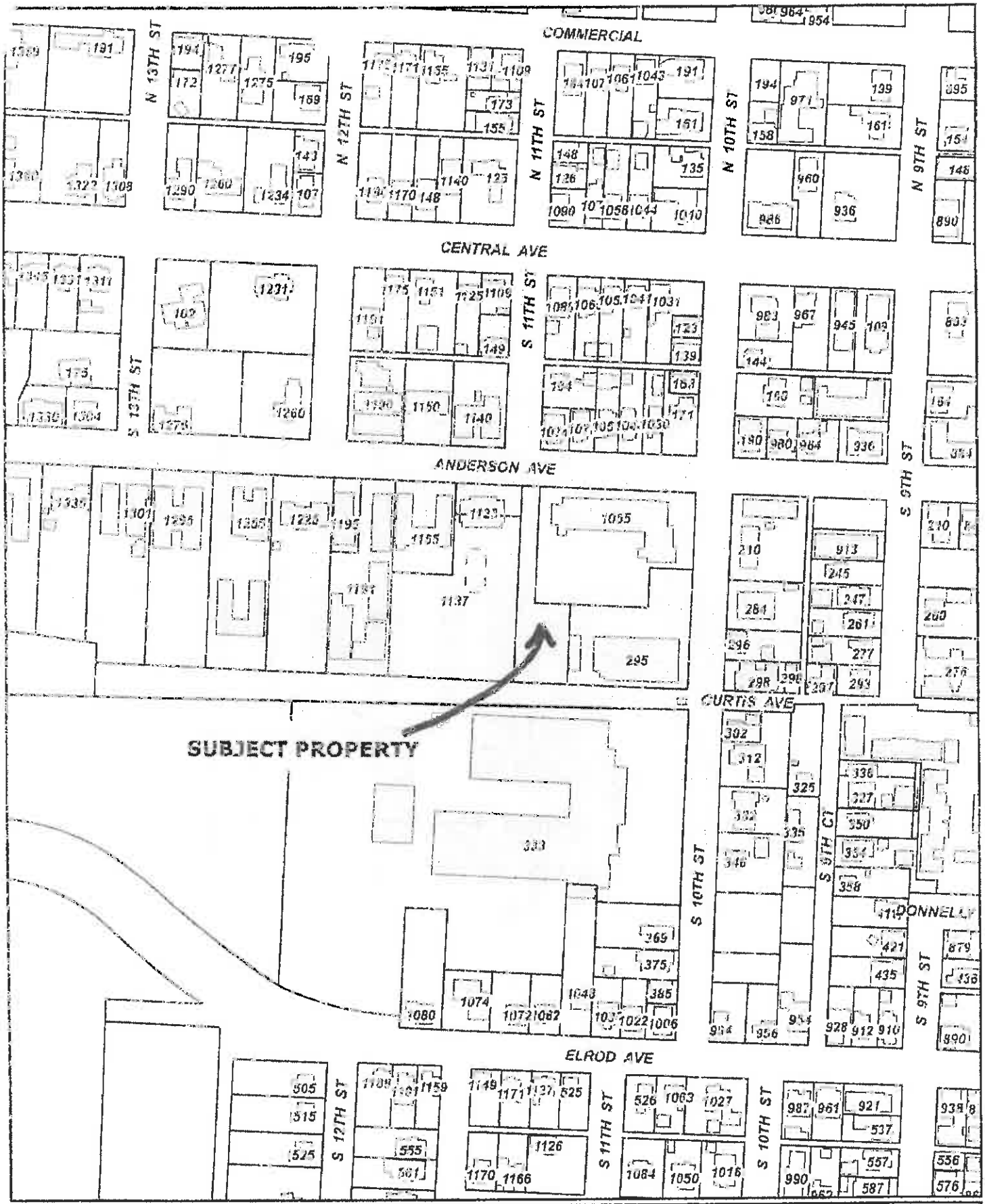
for Kevin P. Moynahan
Chief, Regulatory Branch

Enclosures

Copy Furnished:

Oregon Department of State Lands (Kiryuta)
Oregon Department of Environmental Quality (Saxon)
Oregon Department of Land Conservation and Development (Hickner)
Civil West Engineering (Hodge)

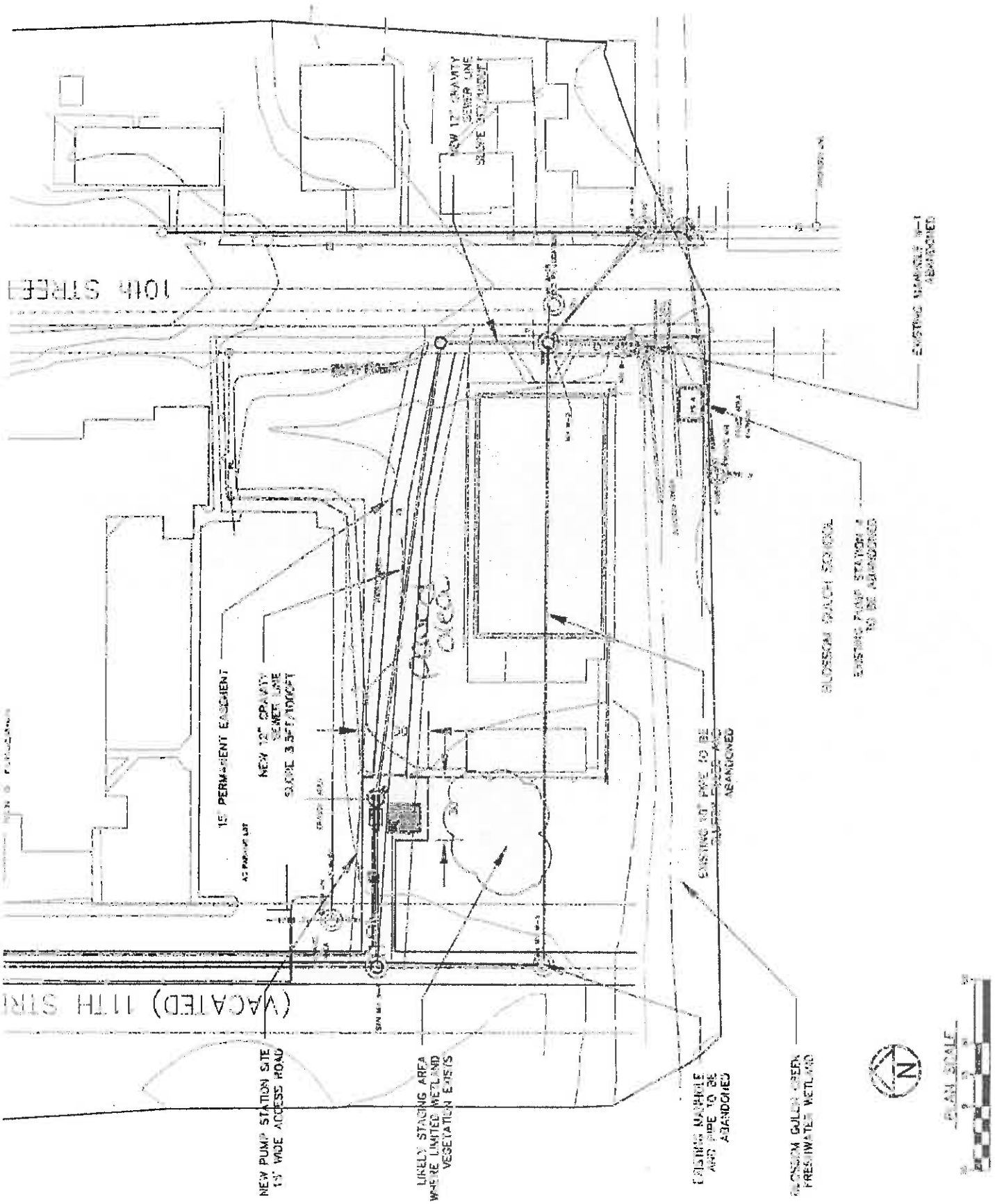

COOS BAY
Bunker Hill
Bay Park
Englewood
Radio Station (KCBY-TV)
Water Tank
Sewage Disposal Ponds
Radio Tower
Coos River
Slough
Trailer Park
Cemetery
Sunset
Light
4801
4800
T. 25 S.

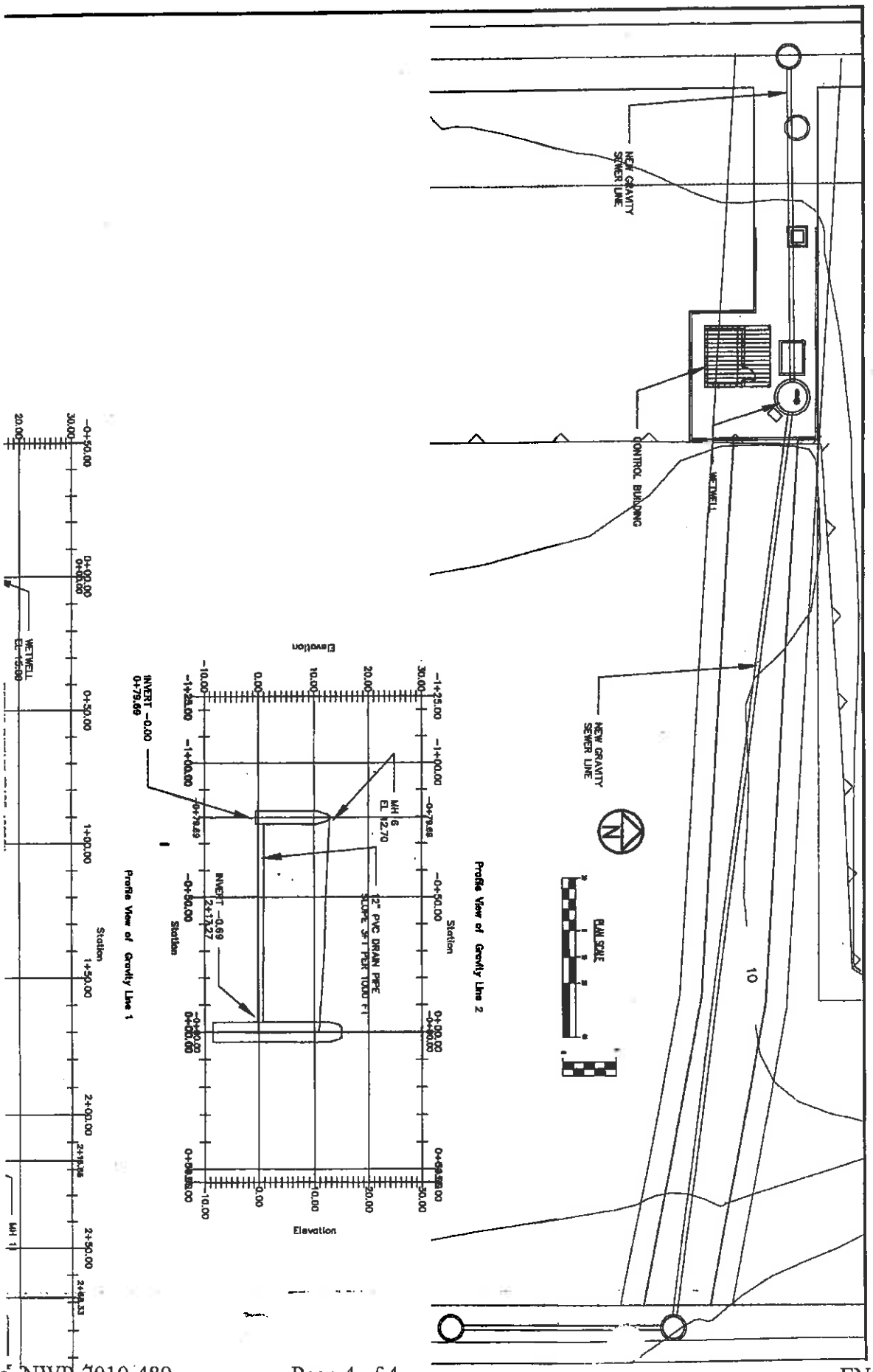


Disclaimer:
This document is produced using a Geographic Information System (GIS). The data contained herein is intended to be a graphical representation only and is by no means an official survey or legal interpretation thereof. The City of Coos Bay provides this data in good faith and makes no warranties, guarantees or representations of any kind, either expressed or implied, as to the content, accuracy, completeness or reliability of this data.

N
W E
S

1 INCH = 203 FEET


10th STREET
(VACATED) 11TH STR
15' PERMANENT EASEMENT
NEW 12" GRAVITY SEWER LINE
NEW PUMP STATION SITE
15' WIDE ACCESS ROAD
LIKELY STAGING AREA
WHERE LIMITED WETLAND
VEGETATION EXISTS
EXISTING MANHOLE
AND PIPE TO BE
ABANDONED
EXISTING WETLAND
EXISTING MANHOLE #1
ABANDONED
BUSSEY PATCH SEWER
EXISTING PUMP STATION
TO BE ABANDONED
N
PLAN SCALE


NEW GRAVITY SEWER LINE
CONTROL BUILDING
WETWELL
NEW GRAVITY SEWER LINE
PLAN SCALE
10
Profile View of Gravity Line 2
Elevation
Station
MH 8
EL 12.70
12" PVC DRAIN PIPE
SLOPE .5FT PER 100.0 FT
INVERT -0.69
2+17.27
INVERT -0.00
0+79.69
Profile View of Gravity Line 1
WETWELL
EL 15.00
MH 1

US Army Corps of Engineers
Portland District

Nationwide (NWP) Regional Permit Conditions Portland District

The following Nationwide Permit (NWP) regional conditions are for the Portland District Regulatory Branch boundary. Regional conditions are placed on NWPs to ensure projects result in less than minimal adverse impacts to the aquatic environment and to address local resource concerns.

ALL NWPs –

1. **High Value Aquatic Resources:** Except for NWPs 3, 20, 27, 32, 38, 47 and 48, any activity that would result in a loss of waters of the United States (U.S.) in a high value aquatic resource is not authorized by NWP. High value aquatic resources in Oregon include bogs, fens, wetlands in dunal systems along the Oregon coast, eel grass beds, vernal pools, aspen-dominated wetlands, alkali wetlands, and Willamette Valley wet prairie wetlands.

   Ø Willamette Valley wet prairie wetlands are characterized by high species diversity with a dominance of cespitose graminoids such as tufted hairgrass (*Deschampsia caespitosa*). Plant species associated with Willamette Valley wet prairie wetlands may also include ESA-listed plants such as Bradshaw's lomatium (*Lomatium bradshawii*), Willamette daisy (*Erigeron decumbens* var. *decumbens*), Nelson's checkermallow (*Sidalcea nelsoniana*) and rough popcorn flower (*Plagiobothrys hirtus*). Soil series associated with Willamette Valley wet prairie wetlands may include, but are not limited to, the Dayton, Amity, Bashaw, Natroy, and Waldo series.

2. **In-water Work Window:** All in-water work shall be conducted during the listed in-water work window, as applicable (refer to Oregon Department of Fish and Wildlife (ODFW) "Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources" http://www.dfw.state.or.us/lands/inwater/inwater_guide.pdf).

3. **Cultural Resources and Human Burials-Inadvertent Discovery Plan**: Permittees shall immediately cease all ground disturbing activities and notify the Portland District Regulatory Branch if at any time during the course of the work authorized, human burials, cultural items, or historic properties, as identified by the National Historic Preservation Act and Native American Graves and Repatriation Act, are discovered and/or may be affected. The Permittee shall follow the procedures outlined below:

- Immediately cease all ground disturbing activities.
- Notify the Portland District Regulatory Branch. Notification shall be made by fax (503-808-4375) as soon as possible following discovery but in no case later than 24 hours. The fax shall clearly specify the purpose is to report a cultural resource discovery.
- Follow up the fax notification by contacting the Corps representative (by email and telephone) identified in the permit letter.
- Project Located in Oregon: Notify the Oregon State Historic Preservation Office (503-986-0674).
- Project Located in Washington: Notify the Washington Department of Archaeology and Historic Preservation (360 586-3077).

Failure to stop work immediately and until such time as the Corps has coordinated with all appropriate agencies and complied with the provisions of 33 CFR 325, Appendix C, the National Historic Preservation Act, Native American Graves and Repatriation Act and other pertinent regulations, could result in violation of state and federal laws. Violators are subject to civil and criminal penalties.

4. **Erosion Control:** During construction, permittee shall ensure that all practicable erosion and sediment control measures are installed and maintained in good working order to prevent unauthorized discharge of materials carried by precipitation, snow melt, wind or any other conveyance mechanism into any waterways and wetlands. The permittee is referred to Oregon Department of Environmental Quality's (DEQ) *Oregon Sediment and Erosion Control Manual*, April 2005, for proper implementation of practicable sediment and erosion control measures.

5. **Heavy Equipment:** Permittee shall ensure that all heavy equipment is operated from the bank and not placed in the stream unless specifically authorized by the District Engineer. Heavy equipment working in waters of the U.S. shall be placed on removable mats or pads. Following the removal of the mats or pads, the area shall be restored to pre-project conditions.

6. **Deleterious Waste:** All discharge water created during construction (e.g. concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids, etc.) shall be treated to remove debris, sediment, petroleum products, metals, and other pollutants likely to be present.

7. **Fish Passage:** The permittee shall ensure activities authorized by nationwide permit will not restrict passage of aquatic life. Activities such as the installation of culverts, intake structures, diversion structures, or other modifications to channel morphology, must be designed to be consistent with fish passage standards developed by the Oregon Department of Fish and Wildlife (ODFW) and the National Marine Fisheries Service (NMFS). The standards can be found at OAR 635-412-0035. The streambed shall be returned to pre-construction contours after construction unless the purpose of the activity is to eliminate a fish barrier.

8. **Fish Screening:** The permittee shall ensure that all intake pipes utilize fish screening that complies with standards developed by NMFS (Juvenile Fish Screen Criteria (revised February 16, 1995) and Addendum: Juvenile Fish Screen Criteria for Pump Intakes (May 9, 1996)).

9. **Upland Disposal:** Material disposed of in uplands shall be placed in a location and manner that prevents discharge of the material and/or return water into waterways or wetlands unless otherwise authorized by the Corps of Engineers (such as by NWP 16).

10. **Inspection of the Project Site:** The permittee shall allow representatives of the Corps to inspect the authorized activity to confirm compliance with nationwide permit terms and conditions. A request for access to the site will normally be made sufficiently in advance to allow a property owner or representative to be on site with the agency representative making the inspection.

11. **Sale of Property/Transfer of Permit:** The permittee shall obtain the signature(s) of the new owner(s) and transfer this permit in the event the permittee sells the property associated with this permit. To validate the transfer of this permit authorization, a copy of this permit with the new owner(s) signature shall be sent to the Portland District office at the following address: U.S. Army Corps of Engineers, 1600 Executive Parkway, Suite 210, Eugene, Oregon 97401-2156.

NWP 12 – Utility Line Activities

1. The permittee shall ensure that utility lines buried within or adjacent to wetland areas utilize trench-blockers of a type and design sufficient to prevent the drainage of the wetland areas (e.g. bentonite clay plugs, compacted sand bags, etc.).
2. The upper 12 inches of topsoil must be removed and stockpiled separately from subsurface soils and shall be used as the final layer in backfilling the trench.

US Army Corps of Engineers
Portland District

Nationwide (NWP) Permit Conditions

33 CFR Part 330; Issuance of Nationwide Permits – March 12, 2007

C. General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as appropriate, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of the Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for any NWP.

1. ***Navigation.***

(a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittees' expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure of work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. ***Aquatic Life Movements.*** No activity may substantially disrupt the necessary life cycle of movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be installed to maintain low flow conditions.

3. ***Spawning Areas.*** Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. ***Migratory Bird Breeding Areas:*** Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. ***Shellfish Beds.*** No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWP's 4 and 48.

6. ***Suitable Material.*** No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

7. ***Water Supply Intakes.*** No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. ***Adverse Effects From Impoundments.*** If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting it flows must be minimized to the maximum extent practicable.

9. ***Management of Water Flows.*** To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and stormwater management activities, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters, if it benefits the aquatic environment (e.g., stream restoration or relocation activities.)

10. ***Fills Within 100-Year Floodplains.*** The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. ***Equipment.*** Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. ***Soil Erosion and Sediment Controls.*** Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.

13. ***Removal of Temporary Fills.*** Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. ***Proper Maintenance.*** Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety.

15. ***Wild and Scenic Rivers.*** No activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g. National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service.)

16. ***Tribal Rights.*** No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

17. ***Endangered Species.***

(a) No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements.

(c) Non-federal permittees shall notify the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that may be affected by the proposed work or that utilize the designated critical habitat that may be affected by the proposed work. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the project, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification the proposed activities will have "no effect" on listed species or critical habitat, or until Section 7 consultation has been completed.

(d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific regional endangered species conditions to the NWPs.

(e) Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the FWS or the NMFS, both lethal and non-lethal "takes" of protected species are in violation of the ESA. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their World Wide Web pages at http://www/fws.gov/ and http://www.noaa.gov/fisheries.html respectively.

18. ***Historic Properties.***

(a) In cases where the district engineer determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the authorized activity may have the potential to cause effects to any historic properties listed, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Office or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR.4 (g)). The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the district engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties which the activity may have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects or that consultation under Section 106 of the NPHA has been completed.

(d) The district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA Section 106 consultation is required. Section 106 consultation is not required when the Corps determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3 (a)). If NHPA Section 106 consultation is required and will occur, the district engineer will notify the non-Federal applicant that he or she cannot begin work until Section 106 consultation is completed.

(e) Prospective permittees should be aware that Section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify ACHP and provide documentation specifying the circumstances, explaining the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

19. *Designated Critical Resource Waters.* Critical resource waters include, NOAA-designated marine sanctuaries, National Estuarine Research Reserves, state natural heritage sites, and outstanding national resource waters or other waters officially designated by a state as having particular environmental or ecological significance and identified by the district engineer after notice and opportunity for public comment. The district engineer may also designate additional critical resource waters after notice and opportunity for comment.

(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, and 50 for any activity within, or directly affecting critical resource waters, including wetlands adjacent to such waters.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with General Condition 27, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

20. *Mitigation.* The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that some other form of mitigation would be environmentally appropriate and provides a project-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the aquatic environment. Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, wetland restoration should be the first compensatory mitigation option considered.

(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation, such as stream restoration, to ensure that the activity results in minimal adverse effects on the aquatic environment.

(e) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any project resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that a project already meeting the established acreage limits also satisfies the minimal impact requirement associated with the NWPs.

(f) Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the establishment, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, riparian areas may be the only compensatory mitigation required. Riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(g) Permittees may propose the use of mitigation banks, in-lieu fee arrangements or separate activity-specific compensatory mitigation. In all cases, the mitigation provisions will specify the party responsible for accomplishing and/or complying with the mitigation plan.

(h) Where certain functions and services of waters of the United States are permanently adversely affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.

21. ***Water Quality.*** Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA Section 401, individual 401 Water Quality Certification must be obtained or waived (see CFR 330.4 (c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

22. ***Coastal Zone Management.*** In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4 (d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

23. ***Regional and Case-By-Case Conditions.*** The activity must comply with any regional conditions that may have been added by the Division Engineer (see CFR 330.4(e)) and with any case-specific conditions added by the Corps or by the state, Indian Tribe, or EPA in its Section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

24. ***Use of Multiple Nationwide Permits.*** The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

25. ***Transfer of Nationwide Permit Verifications.*** If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

"When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

_____

(Transferee)

_____

(Date)

26. ***Compliance Certification.*** Each permittee who received an NWP verification from the Corps must submit a signed certification regarding the completed work and any required mitigation. The certification form must be forwarded by the Corps with the NWP verification letter and will include:

(a) A statement that the authorized work was done in accordance with the NWP authorization, including any general or specific conditions;

(b) A statement that any required mitigation was completed in accordance with the permit conditions; and

(c) The signature of the permittee certifying the completion of the work and mitigation.

27. ***Pre-Construction Notification.***

(a) *Timing.* Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the receipt and, as a general rule, will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity:

(1) Until notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) If 45 calendar days have passed from the district's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to General Condition 17 that listed species or critical habitat might be affected or in the vicinity of the project, or to notify the Corps pursuant to General Condition 18 that the activity may have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see CFR 330.4(f)) and/or Section 106 of the National Historic Preservation (see CFR 330.4(g)) is completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee cannot begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d))(2).

(b) *Contents of Pre-Construction Notification*: The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed project;

(3) A description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. The description should be sufficiently detailed to allow the district engineer to determine that the adverse effects of the project will be minimal and to determine the need for compensatory mitigation. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the project and when provided result in a quicker decision);

(4) The PCN must include a delineation of special aquatic sites and other waters of the United States on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters of the United States, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many waters of the United States. Furthermore, the 45-day period will not start until the delineation has been submitted to or completed by the Corps, where appropriate;

(5) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(6) If any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, for non-Federal applicants the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed work or utilize the designated critical habitat that may be affected by the proposed work. Federal applicants must provide documentation demonstrating compliance with the Endangered Species Act; and

(7) For an activity that may affect a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, for non-Federal applicants the PCN must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic property. Federal applicants must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

(c) *Form of Pre-Construction Notification:* The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is a PCN and must include all of the information required in paragraphs (b)(1) through (7) of this general condition. A letter containing the required information may also be used.

(d) *Agency Coordination:*

(1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level.

(2) For all NWP 48 activities requiring pre-construction notification and for other NWP activities requiring pre-construction notification and for other NWP activities requiring pre-construction notification to the district engineer that result in the loss of greater than 1/2-acre of waters of the United States, the district engineer will immediately provide (e.g., via facsimile transmission, overnight mail, or other expeditious manner) a copy of the PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Office (THPO), and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will then have 10 calendar days from the date the material is transmitted to telephone or fax the district engineer that they intend to provide substantive, site-specific comments. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame, but will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(3) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(4) Applicants are encouraged to provide the Corps multiple copies of pre-construction notifications to expedite agency coordination.

(5) For NWP 48 activities that require reporting, the district engineer will provide a copy of each report within 10 calendar days of receipt to the appropriate regional office of the NMFS.

(e) *District Engineer's Decision*: In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If the proposed activity requires a PCN

and will result in a loss of greater than 1/10-acre of wetlands, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for projects with smaller impacts. The district engineer will consider any proposed compensatory mitigation the applicant has included in the proposal in determining whether the net adverse environmental effects to the aquatic environment of the proposed work are minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse effects on the aquatic environmental are minimal, after considering mitigation, the district engineer will notify the permittee and include any conditions the district engineer deems necessary. The district engineer must approve any compensatory mitigation proposal before the permittee commences work. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure no more than minimal adverse effects on the aquatic environment. If the net adverse effects of the project on the aquatic environment (after consideration of the compensatory mitigation proposal) are determined by the district engineer to be minimal, the district engineer will provide a timely written response to the applicant. The response will state that the project can proceed under the terms and conditions of the NWP.

If the district engineer determines that the adverse effects of the proposed work are more than minimal, then the district engineer will notify the applicant either:

(1) That the project does not qualify for authorization under NWP and instruct the applicant on the procedures to seek authorization under an individual permit;

(2) that the project is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level; or

(3) that the project is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse effects occur to the aquatic environment, the activity will be authorized within the 45-day PCN period. The authorization will include the necessary conceptual or specific mitigation or a requirement that the applicant submit a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level. When mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan.

28. ***Single and Complete Project:*** The activity must be a single and complete project. The same NWP cannot be used more than once for the single and complete project.

E. Definitions

Best management Practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categories as structural and non-structural.

Compensatory mitigation: The restoration, establishment (creation), enhancement, or preservation of aquatic resources for the purpose of compensating for unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Discharge: The term "discharge" means any discharge of dredged or fill material and any activity that causes or results in such a discharge.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Ephemeral stream: An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete project in the Corps regulatory program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom of elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters for determining whether a project may quality for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. The loss of stream bed includes the linear feet of stream bed that is filled or excavated. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities eligible for exemptions under Section 404(f) of the Clean Water Act are not considered when calculating the loss of waters of the United States.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. The definition of a wetland can be found at 33 CFR 328.3(b). Non-tidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of standing or flowing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of "open waters" include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: An ordinary high water mark is a line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas (see 33 CFR 328.3(e)).

Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: Re-establishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b) (1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands adjacent to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects waterbodies with their adjacent uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See General Condition 20)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete project: The term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete project must have independent utility (see definition). For linear projects, a "single and complete project" is all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single waterbody several times at separate and distant locations, each crossing is considered a single and complete project. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc. are not separate waterbodies, and crossings of such features cannot be considered separately.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands continuous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a wetland (i.e., water of the United States) that is inundated by tidal waters. The definitions of a wetland and tidal waters can be found at 33 CFR 328.3(b) and 33 CFR 328.3(f), respectively. Tidal waters rise and fall in a predicable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line, which is defined at 33 CFR 328.3(d).

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b) (1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody For purposes of the NWPs, a waterbody is a jurisdictional water of the United States that, during a year with normal patterns of precipitation, has water flowing or standing above ground to the extent that an ordinary high water mark (OHWM) or other indicators of jurisdiction, that waterbody and its adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c) (2)). Examples of "waterbodies" include streams, rivers, lakes, ponds, and wetlands.

US Army Corps of Engineers
Portland District

Oregon Department Land Conservation And Development (DLCD)

Coastal Zone (CZM) Management Concurrence

Standard CZM Conditions – Appendix A

All projects permitted, licensed, or funded by the federal government are subject to review for consistency with the Oregon Coastal Management Program (OCMP). Conditions may be placed on federal permits, licenses, or funding to ensure consistency with the OCMP. The 10 Standard CZM conditions given below are required as part of that consistency concurrence for Nationwide Permits issued in Oregon's Coastal Zone.

Appendix B provides an explanation of why the conditions are necessary to ensure consistency with specific enforceable policies of the management program, and an identification of the specific enforceable policies relevant to each condition.

An applicant may choose to not follow one or more of the OCMP conditions. In that instance, an agreement between the OCMP and the applicant must be reached on what conditions will be attached to the federal permit, license or action.

Failure to come to an agreement shall trigger an objection to the federal action by the OCMP. In that instance, the permittee may appeal the state's objection to the Secretary of Commerce, pursuant to 15 CFR 930; subpart H, within 30 days of receipt of the letter informing the applicant of the OCMP's objection. (Ref. 15 CFR 930.63(e)) In order to grant an override request, the Secretary must find that the activity is consistent with the objectives or purposes of the Coastal Zone Management Act, or is necessary in the interest of national security. A copy of the request and supporting information must be sent to the OCMP and the federal funding, permitting or licensing agency. The Secretary may collect fees from the permittee for administering and processing the request. (Ref 15 CFR 930.63, 1-1-07 Edition)

Appendices A & B addresses the requirements of 15 CFR 930.4(a) (l).

CZ Condition 1. Consistency with Local Comprehensive Plans.

(1) Authorization for projects in Oregon's coastal zone under any nationwide permit is valid only if the proposed project is consistent with or not subject to the applicable local comprehensive plan and implementing land use regulations, or to the statewide land use planning goals where applicable. Permits or other authorizations must be obtained, when required, from the applicable local government before work is initiated under any nationwide permit. Verification of the local jurisdiction's decision must be given to the Corps of Engineers in the form of a completed block seven (7) of the Joint Permit Application. All appeals of the local jurisdiction's decision(s) must be resolved before any regulated work may begin.

(2) All conditions placed on an authorization or permit by the local government are incorporated by reference into the conditions for consistency concurrence by the Oregon Coastal Management Program.

CZ Condition 2. Consistency with Removal-Spill Law.

(1) Authorization for projects in Oregon's coastal zone under any nationwide permit is valid only if the proposed project is consistent with or not subject to the state statutes for state lands and removal-fill in waters of the state. Permits or other authorizations must be obtained when required from the Oregon Department of State Lands (DSL) before any regulated work may begin.

(2) For projects found not subject to the Removal/Fill Law by DSL, any changes in project design or implementation which may reasonably be expected to require application of the Removal/Fill Law shall be submitted to DSL for review.

(3) All conditions placed on a Removal-Fill permit by the Oregon Department of State Lands are incorporated by reference into the conditions for consistency concurrence by the Oregon Coastal Management Program.

CZ Condition 2a. Leases of State Lands.
(1) Authorization for projects in Oregon's coastal zone under any nationwide permit is valid only if the proposed project has obtained any required lease or other license required for the use of state lands or waters. Permits or other authorizations must be obtained when required from the Oregon Department of State Lands (DSL) before any regulated work may begin.

(2) All conditions placed on a lease, license, or authorization by the Oregon Department of State Lands are incorporated by reference into the conditions for consistency concurrence by the Oregon Coastal Management Program.

CZ Condition 3. Department of Environmental Quality.
(1) Authorization for a project in Oregon's coastal zone under any nationwide permit is valid only if the proposed project has been certified or does not require certification by the Oregon Department of Environmental Quality (DEQ) through its 401 Water Quality Certification process.

(2) All conditions placed on a DA license, permit, or authorization by the Oregon Department of Environmental Quality are incorporated by reference into the conditions for consistency concurrence by the Oregon Coastal Management Program.

CZ Condition 4. In-Water Work.
(1) All in-water work, including temporary fills or structures, shall occur within the ODFW recommended period for in-water work for the affected water body. Exceptions to the recommended time periods require specific approval from the Corps, and:

(i) The Corps shall coordinate exceptions to work windows with ODFW and NMFS (NOAA Fisheries). Decisions to not apply ODFW or NMFS work windows shall be accompanied by written approval from ODFW;
(ii) On tribal lands, the Corps shall coordinate exceptions with the EPA.

(2) No work shall be authorized within or directly impacting areas identified by the Oregon Department of Fish and Wildlife (ODFW) as used by or susceptible for use by spawning fish, unless approved by ODFW. This restriction shall apply year-round, and is not limited by spawning season or by the presence or absence of fish at any given time.

CZ Condition 5. Fish and Aquatic Life Passage.
(1) Where applicable, all authorized projects shall be in conformance with ODFW standards for fish passage **http://www.dfw.state.or.us/fish/passage/** decisions to abrogate ODFW fish passage standards shall be accompanied by written approval from ODFW.

(2) No work shall be authorized that does not provide for adequate passage of "aquatic life." Aquatic life shall be interpreted to include amphibians, reptiles, and mammals whose natural habitat includes waters of this state and which are generally present in or around, or pass through the project site.

(3) This condition is effective only where ODFW regulations apply.

CZ Condition 6. Heavy Equipment Use
(1) Heavy equipment shall be operated from the bank, and not placed in a stream unless specifically authorized. In-stream work may be authorized by the Corps of Engineers if necessary in the interest of safety or due to site conditions prohibiting work from the bank.

(2) Heavy equipment in wetlands or on soft soils must be placed on mats or other similar devices to minimize damage to natural resources.

(i) If the period of use of heavy equipment on the wetland area will exceed 14 (fourteen) calendar days from start to finish, the applicant/permittee shall notify the Corps prior to starting the work. The Corps shall assess if the longer work period is necessary, and what additional protective measures may be required to minimize or mitigate the impacts.
(ii) All mats or other protective measures shall be removed at the end of each workday unless the Corps determines that to do so would cause greater harm to the resource.

(3) Irrespective of measures taken to limit unintended impacts from heavy equipment, any damage done to vegetation, land, or waterways within or impacting waters of the state beyond the scope of the permit shall be mitigated.

(4) This condition is effective only in situations where the Removal-Fill Law applies.

CZ Condition 7. Collateral Damage
(1) Permittees shall be required to repair, restore, or mitigate for any and all impacts within or impacting waters of the state which occur in the course of the work, including those beyond the scope of the permitted work, whether intentional or unintentional, including those impacts due to accident, misinterpretation, or misunderstanding.

(2) This condition is effective only in situations where the Removal-Fill Law applies.

CZ Condition 8. Multiple Permits
(1) For each NWP-authorized activity, the acreage of impact for a permitted activity shall not exceed the limit for that specific permit. When there are two or more nationwide permits combined for a single project site, the impact for each activity must be limited to that specifically permitted under each applicable NWP. For example, when combining two NWPs at a single site, if one nationwide permit authorizes 1/4 acre of impact for a house, and another 1/4 acre of impact
for a road, the total impact *due to the house* may not exceed 1/4 acre.

(2) This condition is effective only in situations where the Removal-Fill Law applies.

CZ Condition 9. Aquaculture
(1) For projects involving commercial aquaculture or mariculture cultivation of oysters, clams, and mussels, authorization for projects in Oregon's coastal zone under a nationwide permit is valid only if the applicant has obtained authorization, as required, from the Oregon Department of Agriculture (ODA) for use of state submerged and submersible lands for aquaculture purposes.

(2) All conditions placed on an aquaculture or mariculture operation by the ODA are incorporated by reference into the conditions for consistency concurrence by the Oregon Coastal Management Program.

(3) This condition is effective only in situations under the jurisdiction of the ODA.

CZM Concurrence - Appendix B

Standard CZM Conditions - Basis in Law

This appendix provides an explanation of why the conditions given in Appendix A are necessary to ensure consistency with enforceable policies of the Oregon Coastal Management Program, and references the specific enforceable policies relevant to each condition. This Appendix addresses the requirements of 15 CFR 930.4(a) (l).

CZ Condition 1. Consistency with Local Comprehensive Plans.
OAR 660-031-0030 requires denial of a state permit when a proposed activity is not in compliance with a Statewide Planning Goal or compatible with an Acknowledged
Comprehensive Plan. Further support for this condition is found in ORS 197.1 80(1) (a & b), which requires compliance with goals and acknowledged plans.

Paragraph two is considered a logical extension of the requirements of -0030 and 197.180. Any condition required for local approval must also be an enforceable provision of the coastal program (through the Goals and acknowledgement) to be included in the federal permit to ensure consistency.

CZ Condition 2. Consistency with Removal-Fill Law.
The OCMP states that the general criteria for assessing consistency are whether the activity or project conforms to the mandatory policies set forth in applicable state statutes and rules. (Green Book, p 51) Those statutes are found in Table 3, page 23, of the Green Book. As referenced in the Green Book, ORS 541 (later renumbered ORS 196 in 1987) is the Removal-Fill Law. DSL is responsible for administering this law, and the decision to issue a permit or find no jurisdiction constitutes an affirmative determination of consistency with the Removal-Fill Law. (Green Book, P 17)

Paragraph two is considered a logical extension of the requirements of ORS 196. Any condition required for state approval must also be an enforceable provision of the coastal program (through the Goals and plan acknowledgement) to be included in the federal permit for consistency.

CZ Condition 2a. Leases of State Lands.
OAR 141-082-0060 gives DSL the authority to place terms on a lease of state lands as it sees fit. This rule is based upon ORS 274.

Paragraph two is considered a logical extension of the requirements of -0060 and ORS 274. Any condition required for state approval must also be an enforceable provision of the coastal program to be included in the federal permit for consistency.

CZ Condition 3. Department of Environmental Quality.
The OCMP states that the general criteria for assessing consistency are whether the activity or project conforms to the mandatory policies set forth in applicable state statutes and rules. (Green Book, p 51) Those statutes are found in Table 3, page 23, of the Green Book. ORS 454,459, 467, and 468 are referenced as DEQ authorities under the OCMP.

* Note. To be valid any condition asserted under consistency determination must be based on an authority included in the OCMP. Any other authority may be valid under the requirements of Section 401 of the Clean Water Act, but would not be valid for federal coastal zone consistency. ORS 454,459,467 and 468 are referenced as DEQ authorities under the OCMP. Coastal Zone condition 3 is independent of any other conditions DEQ might place on a 401 certifications which are based on authorities other than 454,459,467, and 468.

CZ Condition 4. In-Water Work.
(1) The Fish and Wildlife Commission is responsible for the protection and management of fish and wildlife in the state. (ORS 496.012) Any federal action should be fully consistent with ODFW policies promulgated under ODFW authorities (ORS 496,498, 501, and 506), irrespective of ORS 196 (Removal-Fill Law) or other authorities.

ODFW promulgated the *Oregon Guidelines for Timing of In- Water Work to Protect Fish and Wildlife Resources* under ORS 496.012 and 496.138. OAR 141-085-0029(9) (c) requires consultation by DSL with ODFW if in-water work is requested outside the dates set by ODFW in the *Guidelines.* The Corps is given leave to abrogate these rules, but a clear record of their decision is appropriate.

(2) This condition is based upon the plenary authority of ORS 496.012, is consistent with SLOPES, but goes a little further in exerting ODFW authority.

CZ Condition 5. Fish and Aquatic Life Passage.
The Fish and Wildlife Commission is responsible for the protection and management of fish and wildlife in the state (ORS 496.012). This is taken to include the management and protection of habitat, though 496.012 does not use 'habitat.' Any federal action should be l y consistent with ODFW policies promulgated under OCMP-incorporated ODFW authorities (ORS 496,498, 501, and 506), regardless of ORS 196 (Removal-Fill Law) or other authorities. (Green Book, p 23)

ORS 509.585 sets out requirements for fish passage at artificial obstructions. ORS 509 was incorporated in the OCMP as a routine program change on March 20, 2002 in a letter to Nan Evans from John King.

"Waters of this state" shall be interpreted consistent with its meaning for ORS 496.012. See also definition given in OAR 141-085.

Relevant definitions:

> 141-085-0010 (5) "Aquatic Life and Habitats" means the aquatic environment including fish, wildlife and plant species dependent upon environments created and supported by the waters of this state. Aquatic life includes communities and species populations that are adapted to aquatic habitats for at least a portion of their life.
>
> (225) "Waters of this State" means natural waterways including all tidal and non-tidal bays, intermittent and perennial streams (i.e., streams), lakes, wetlands and other bodies of water in this state, navigable and

non-navigable, including that portion of the Pacific Ocean, which is in the boundaries of this state. "Waters of this state" does not include the ocean shore, as defined in ORS 390.605.

496.004 (19) "Wildlife" means fish, shellfish, wild birds, amphibians and reptiles, and
feral swine as defined by State Department of Agriculture rule, and other wild mammals.

CZ Condition 6. Heavy Equipment Use
The basis for this condition is found at OAR 141-085-0029.7, .8, and .9c & d, and relates to the minimization of impacts generally for any activity.

CZ Condition 7. Collateral Damage
This condition is based upon OAR 141-085-0029.9.c, minimization of impacts, and 141-085-0079, enforcement. This condition would extend a specialized provision to the NWP program based upon general provisions of the OAR. There are currently provisions in state law requiring this type of restoration, but nothing explicit. This would clarify an existing situation, making enforcement easier and bringing to bear the Corps' enforcement authority.

CZ Condition 8. Multiple Permits
OAR 141-089-0100(6) prohibits the use of more than one state general permit on a project. This condition brings Corps practice more in line with state enforceable policy. DSL *approval is required for the modification of this condition.*

CZ Condition 9. Aquaculture
ORS 622.220 gives ODA authority over shellfish aquaculture. ORS 622 is incorporated into the OCMP.

CZM Concurrence: Appendix C

Guidance for Determination of Denial of Advance Concurrence

Advance concurrence is not extended to the following two classes of permits:

- Any permit where the project is within or directly impacts the Territorial Sea (waters and seabed extending three (3) nautical miles seaward from the coastline, in conformance with federal law), excepting projects permitted under NWP 1 or NWP 5.
- Any project utilizing NWP 29 or NWP 39 requiring a local plan amendment, text amendment, zoning change, goal exception, discretionary decision, or action by a city or county council or commission.

The District Engineer shall be responsible for determining when proposed projects meet one or both of these circumstances. In these instances, the DLCD will undertake an individual review of the project to ensure proper adherence to the OCMP.

Territorial Sea:

Oregon's Territorial Sea extends from the shoreline seaward for a distance of three (3) nautical miles. Estuaries are not considered to be part of the Territorial Sea. Excepting projects permitted under NWP 1, ***Aids to Navigation,*** and NWP ***5, Scientific Measurement Devices,*** any project which occurs on or under the Territorial Sea, or on or beneath the sea bottom, shall be reviewed on an individual basis by DLCD for consistency with OCMP. In addition, any project which results in new or increased activity or impacts on or under the Territorial Sea, or on or under the sea bottom, shall be reviewed on an individual basis by DLCD for consistency with OCMP.

Examples of activities falling under this exception include:

- Construction of an offshore structure or platform;
- Installation of wave or wind energy extraction devices and related infrastructure;
- Installation of a buried or exposed cable;
- A new or expanded port facility which increases ship traffic in the Territorial Sea;

- A new or relocated shipping channel in the Territorial Sea.

These examples are illustrative, not comprehensive. Any questions regarding application of this criterion should be directed to the Oregon Coastal Management Program office.

NWP 29 and 39

Advance concurrence is withheld from any project utilizing NWP 29 or 39 ***and*** requiring a local plan amendment, text amendment, zoning change, goal exception, discretionary decision, or action by a city or county council or commission. Such projects may be identified by block seven (7) of the Joint Permit Application.

Examples of situations falling under this exception include:

- Permit applications where the city/county has checked the box "This project is **not** consistent with the comprehensive plan.. ." in block seven (7) of the JPA;
- The project would require an amendment to a comprehensive plan;
- The project would require a change in zoning;
- The project would require an exception to a Statewide Planning Goal.

These examples are illustrative, not comprehensive. Any questions regarding application of this criterion should be directed to the Oregon Coastal Management Program office.

COMPLIANCE CERTIFICATION

U.S. Army Corps of Engineers
North Bend Field Office
2201 N. Broadway Suite C
North Bend, Oregon 97459-2372

1. Permittee Name: **City of Coos Bay**
(Blossom Gulch Creek – Sewer Pump Station)

2. County: **Coos**

2. Corps Permit No: **NWP-2010-489**

3. Corps Contact: **Kate Groth**

4. Type of Activity: **Nationwide Permit No. 12 Utility Line Activities**

Please sign and return form to the address above:

I hereby certify that the work authorized the above referenced permit has been completed in accordance with the terms and conditions of said permit and that required mitigation is completed in accordance with the permit conditions, except as described below.

_____

Signature of Permittee **Date**

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

A. REPORT COMPLETION DATE: SEPTEMBER 24, 2010

B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:
City of Coos Bay
Public Works Department
500 Central Avenue
Coos Bay, Oregon 97420

C. DISTRICT OFFICE, FILE NAME, AND NUMBER: Portland District, NWP-2010-489, City of Coos Bay (Sewer Pump)

D. PROJECT LOCATION(S), BACKGROUND INFORMATION, AND WATERS:

State: Oregon
City: Coos Bay
County: Coos
Name of nearest waterbody: Blossom Gulch

Identify amount of waters in the review area: 0.124 acres

Name of any water bodies on the site that have been identified as Section 10 waters:
Tidal:
Non-Tidal:

Waters of the U.S.

Waterbody	Latitude (dd.ddd °N)	Longitude (dd.ddd °W)	Cowardin Class	Area (Acres)	Length (Feet)	Width (Feet)
Wetland	43.3660614	-124.22333	Palustrine	0.124	90	60

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s): 9/17/2010

F. SUPPORTING DATA:

Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

- ☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant:
- ☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - ☐ Office concurs with data sheets/delineation report.
  - ☒ Office does not concur with data sheets/delineation report. Corps determined the report underestimated wetland area and determined entire project area is a wetland
- ☐ Data sheets prepared by the Corps:
- ☐ Corps navigable waters' study:
- ☐ U.S. Geological Survey Hydrologic Atlas:
  - ☐ USGS NHD data.
  - ☐ USGS 8 and 12 digit HUC maps.
- ☒ U.S. Geological Survey map(s). Cite quad name: Coos Bay.
- ☒ USDA Natural Resources Conservation Service Soil Survey. Citation: online and in file
- ☐ National wetlands inventory map(s). Cite name:
- ☐ State/Local wetland inventory map(s):
- ☒ FEMA/FIRM maps: online and in file.
- ☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
- ☒ Photographs: ☒ Aerial (Name & Date):. In file
  - or ☐ Other (Name & Date):
- ☐ Previous determination(s). File no. and date of response letter:
- ☐ Other information (please specify):

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

9/24/10

Signature and date of
Regulatory Project Manager
(REQUIRED)

Signature and date of
person requesting preliminary JD
(REQUIRED, unless obtaining the signature is impracticable)

G. EXPLANATION OF PRELIMINARY AND APPROVED JURISDICTIONAL DETERMINATIONS:

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable.

Pump Sta 4

Jennifer Wirsing

From: Jim Hossley
Sent: Wednesday, November 03, 2010 12:34 PM
To: Jennifer Wirsing; jhodge@civilwest.com
Subject: FW: NWP-2010-489 City of Coos Bay sewer station
Attachments: app_2010-489.pdf

FYI

-----Original Message-----
From: Groth, Katharine C NWP [mailto:Katharine.C.Groth@usace.army.mil]
Sent: Wednesday, November 03, 2010 11:31 AM
To: SAXON Corey
Cc: Jim Hossley
Subject: NWP-2010-489 City of Coos Bay sewer station

Hi Corey,

I am ready to issue a verification letter to the City of Coos Bay to build a new sewer pump station. The station will be located in a field adjacent to Blossom Gulch Creek. While a wetland delineation was done at the site for another project (unauthorized activity), the Corps found the delineation unacceptable. However, the Corps went on the assumption that the field had some wetland characteristics, as slough sedge was found, soils are dredge fill material, and the field while relatively flat has some slight depressions. The Corps assumed the field, at least partially, is a seasonally wet, palustrine, emergent wetland. The City is intending to install a pump station and associated features in a 30 by 30 foot area. Additionally, a temporary staging area will be located in the wet field. All of the work will occur during the summer when the field is expected to be dry (I did a site visit in September and the field was completely dry). Both of these activities will be covered by the Corps verification letter. All of the new sewer lines will be located under existing paved parking areas or roads. In addition the backfilling of the old sewer lines and pump station does not require a Section 404 permit. Does the City need an individual WQC for the project? I see that utility line substations are not pre-certified under NWP
12 (Utility Line activities). I have attached a copy of the application for your review. Sorry that I missed this earlier.

Thanks,
Kate Groth
US Army Corps of Engineers
Regulatory Branch
North Bend Field Office
2201 N. Broadway, Suite C
North Bend, OR 97459
541-756-2097
Please visit our Customer Survey at
http://per2.nwp.usace.army.mil/survey.html
to let us know how we are doing. We really want to know!

US Army Corps
Of Engineers (Portland District)

Joint Permit Application Form

DATE STAMP

AGENCIES WILL ASSIGN NUMBERS

Corps Action ID Number

Oregon Department of State Lands No

SEND ONE SIGNED COPY OF YOUR APPLICATION TO EACH AGENCY

US Army Corps of Engineers:
District Engineer
ATTN: CENWP-OD-GPPO
Box 2946
Portland, OR 97208-2946
503-808-4373

AND

DSL - West of the Cascades:
State of Oregon
Department of State Lands
775 Summer Street, Suite 100
Salem, OR 97301-1279
503-986-5200

OR

DSL - East of the Cascades:
State of Oregon
Department of State Lands
1645 NE Forbes Road, Suite 112
Bend, Oregon 97701
541-388-6112

AND

Send DSL Application Fees to:
State of Oregon
Department of State Lands
PO Box 4395, Unit 18
Portland, OR 97208-4395
(Attach a copy of the first page of the application)

(1) APPLICANT INFORMATION

Applicant Name and Address	City of Coos Bay Public Works Department 500 Central Avenue Coos Bay, OR 97420	Business Phone # Home Phone # Fax # Email	541-269-8918 541-269-8919 541-269-8916
Authorized Agent Name and Address Check one Consultant ☑ Contractor ☐	Civil West Engineering Services Jerek Hodge 486 E st Coos Bay, OR 97420	Business Phone # Home Phone # Fax # Email	541-266-8601 541-266-8681 jhodge@civilwest.com
Property Owner Name and Address If different from above[1]		Business Phone # Home Phone # Fax # Email	

(2) PROJECT LOCATION

Street, Road or Other Descriptive Location		Legal Description (attach *tax lot map**)			
Between 10th and 11th streets, south of Anderson, across Blossom Gulch Creek from Blossom Gulch Elementary School		Township	Range	Section	Quarter/Quarter
		25S	13W	27	DD
In or near (City or Town)	County	Tax Map #		Tax Lot #[2]	
Coos Bay	Coos	25 13 27 DD		9500, 9504, 9501 Easements	
Wetland/Waterway (pick one)	River Mile (if known)	Latitude (in DD.DDDD format)		Longitude (in DD.DDDD format)	
Wetland		124° 13' 24" W		43° 21' 58" N	
Directions to the site	Existing pump station is located at Blossom Gulch School adjacent to creek. New pipeline begins north of creek and travels west through Head Start parking lot to open field. New forcemain pipeline runs up alley of 11th St and north towards Central Avenue.				

[1] If applicant is not the property owner, permission to conduct the work must be attached.
[2] Attach a copy of all tax maps with the project area highlighted.

* *Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.*

(3) PROPOSED PROJECT INFORMATION

Type: Fill ☒ Excavation (removal) ☒ In-Water Structure ☐ Maintain/Repair an Existing Structure ☒

Brief Description: Construct new sewer pump station in grassy area and fill 30x30 area above flood line, excavate parking lot and road for pipeline

Fill

Riprap ☒ Rock ☒ Gravel ☒ Organics ☐ Sand ☐ Silt ☐ Clay ☐ Other: ☐

Wetlands	Permanent (cy)	Temporary (cy)	Total cubic yards for project (including outside OHW/wetlands)	133 yards at Pump Station site
	0	0		
	Impact Area in Acres	Dimensions (feet)		
		L' W' H'		
Waters below OHW	Permanent (cy)	Temporary (cy)	Total cubic yards for project (including outside OHW/wetlands)	0
	0	0		
	Impact Area in Acres	Dimensions (feet)		
		L' W' H'		

Removal

Wetlands	Permanent (cy)	Temporary (cy)	Total cubic yards for project (including outside OHW/wetlands)	1233 yard total yards temporarily moved for pipe installation, some may be suitable for Station site
		600		
	Impact Area in Acres	Dimensions (feet)		
		L' W' H'		
Waters below OHW	Permanent (cy)	Temporary (cy)	Total cubic yards for project (including outside OHW/wetlands)	0
	Impact Area in Acres	Dimensions (feet)		
		L' W' H'		
Total acres of construction related ground disturbance (If 1 acre or more a 1200-C permit may be required from DEQ)				0.25

Is the disposal area upland? Yes ☐ No ☐ Impervious surface created? 0<1 acre ☒ 0>1 acre? ☐

	Yes	No
Are you aware of any state or federally listed species on the project site?		x
Are you aware of any Cultural/Historic Resources on the project site?		x
Is the project site within a national Wild & Scenic River?		x
*Is the project site within a State Scenic State Scenic Waterway?**		x

If yes, please explain in the project description (in block 4)

(4) PROPOSED PROJECT PURPOSE AND DESCRIPTION

Purpose and Need:

*Provide a description of the public, social, economic, or environmental benefits of the project along with any supporting formal actions of a public body (e.g. city or county government), as appropriate.**

Coos Bay has a sanitary pump station that is undersized and aged which requires major upgrades or replacement. As the existing pump station is located directly in a salmonid fish hatchery and overflows into it during flood events, upgrading the existing structure and components is not the primary choice. Instead a new pump station will be built north of Blossom Gulch Creek along with associated sewage conveyance systems. The pipeline routing and pump station sites have been determined by the easements granted to the City. The future site piping will be routed under the road right of ways and an existing parking lot.

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Project Description:

Please describe in detail the proposed removal and fill activities, including the following information:

* Volumes and acreages of all fill and removal activities in waterway or wetland separately
* Permanent and temporary impacts
* Types of materials (e.g., gravel, silt, clay, etc.)
* How the project will be accomplished (i.e., describe construction methods, equipment, site access)
* *Describe any changes that the project may make to the hydraulic and hydrologic characteristics (e.g., general direction of stream and surface water flow, estimated winter and summer flow volumes) of the waters of the state, and an explanation of measures taken to avoid or minimize any adverse effects of those changes.*
* Is any of the work already complete? Yes ☐ No ☒ If yes, please describe the completed work.

In addition, for fish habitat or wetland restoration or enhancement activities, complete the information requested in supplemental Fish Habitat or Wetland Restoration and Enhancement form.

Project Drawings

State the number of project drawing sheets included with this application: 2

A complete application must include a location map, site plan, cross-section drawings and recent aerial photo as follows and as applicable to the project:

* **Location map** (must be legible with street names)
  * Site plan including,
  * Entire project site and activity areas
  * Existing and proposed contours
  * Location of ordinary high water, wetland boundaries or other jurisdictional boundaries
  * Identification of temporary and permanent impact areas within waterways or wetlands
  * Map scale or dimensions and north arrow
  * Location of staging areas
  * Location of construction access
  * Location of cross section(s), as applicable
  * Location of mitigation area, if applicable
* **Cross section drawing**(s) including:
  * Existing and proposed elevations
  * Identification of temporary and permanent impact areas within waterways or wetlands
  * Ordinary high water and/or wetland boundary or other jurisdictional boundaries
  * Map scale or dimensions
* **Recent Aerial photo** (1:200, or if not available for your site, the highest resolution available)

Will any construction debris, runoff, etc., enter a wetland or waterway? Yes ☒ No ☐

If yes, describe the type of discharge and show the discharge location on the site plan.

Work will be performed on the site during dry weather. Discharges could occur either through a summer rainstorm or during dewatering operations necessary to create a dry bed when installing the gravity sewer line and pump station wetwell. If necessary, the Contractor can be instructed to dewater into a storage truck. The Contractor will be required to maintain a sediment control plan and barriers around the construction site.

There is an existing storm drainage pipe that has been recently replaced which routes to Blossom Gulch Creek. During the course of the new construction it may be necessary to temporarily take this pipe out of service when installing new gravity sewer lines.

Estimated project start date:	5/30/2011	Estimated project completion date:	10/30/2011

* ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(5) PROJECT IMPACTS AND ALTERNATIVES

Alternatives Analysis:

Describe alternative sites and project designs that were considered to avoid or minimize impacts to the waterway or wetland. (Include alternative design(s) with less impact and reasons why the alternative(s) were not chosen. Reference OAR 141-085-0565 (1) through (6) for more information).*

The existing pump station is located at the bottom of a sanitary drainage basin. Sewer systems flow downhill and must ultimately be pumped to reach a higher location. Therefore, the alternative locations are limited for locating the new pump station or the new wetwell must be located so deep as to make it economically infeasible. Most of the surrounding area is built up with housing and structures. This leaves either the school parking lot, the nearby undeveloped lot, a private parking lot, or the structure must remain where it is. As was mentioned earlier, the creek itself is a salmonid fish hatchery, and flooding either from the creek or from sewage overflows make maintaining the existing location problematic. The new site is the nearest clear ground and is the furthest from the creek possible. The could be placed in the school parking lot but this would require work under the creek when routing new sewer pipe.

Measures to Minimize Impacts

Describe what measures you will use (before and after construction) to minimize impacts to the waterway or wetland. These may include but are not limited to the following:

- *For projects with ground disturbance include an erosion control plan or description of other best management practices (BMP's) as appropriate. (For more information on erosion control practices see DEQ's Oregon Sediment and Erosion Control Manual)*
- *For work in waterways where fish or flowing water are likely to be present, discuss how the work area will be isolated from the flowing water.*
- *If native migratory fish are present (or were historically present) and you are installing, replacing or abandoning a culvert or other potential obstruction to fish passage, complete and attach a statement of how the Fish Passage Requirements, set by the Oregon Department of Fish and Wildlife will be met.*

The Contractor will be responsible for the specifics of the sediment and erosion control plan. As the site is relatively flat and has substational storm drainage placed around it, it is anticipated the dry season construction will not generate large amount of soil disturbance from rain. Typically the site will have diversion measures to prevent water from running over open soil and sediment barriers to prevent loss of soil into the creek. Work will be greater than 50 ft from the shoreline of the creek and wetland areas designated by a pending wetland delineation from the adjacent property owner worked around. Nevertheless, some impact of machinery and supplies may occur in grassy areas that are designated wetland. Contractor will be required to restore landscape to original condition upon completion of work.

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Description of resources in project area

Ocean ☐ Estuary ☐ River ☐ Lake ☐ Stream ☒ Freshwater Wetland ☒

Describe the existing **physical and biological characteristics** of the wetland/waterway site by area and type of resource (Use separate sheets and photos, if necessary).

For wetlands, include, as applicable:

- *Cowardin and Hydrogeomorphic (HGM) wetland class(s)**
- *Dominant plant species by layer (herb, shrub, tree)**
- Whether the wetland is freshwater or tidal
- *Assessment of the functional attributes of the wetland to be impacted**
- Identify any vernal pools, bogs, fens, mature forested wetland, seasonal mudflats, or native wet prairies in or near the project area.)

For waterways, include a description of, as applicable:

- *Channel and bank conditions**
- *Type and condition of riparian vegetation**
- *Channel morphology (i.e., structure and shape)**
- *Stream substrate**
- Fish and wildlife (type, abundance, period of use, significance of site)
- *General hydrological conditions (e.g. stream flow, seasonal fluctuations)**

Area consists of mowed grass and asphalt cement pavement. Top layers of soil are gravelly sand with deeper layers where wetwell will penetrate is peat and bay mud. Grass species are being categorized as part of the wetland delineation for Columbia Care Services. Nearby wetland areas are filled tidal marshes that are now freshwater creek shore.

*Describe the existing **navigation, fishing and recreational** use of the waterway or wetland.**

None

* *Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.*

Site Restoration/Rehabilitation

* *For temporary disturbance of soils and/or vegetation in waterways, wetlands or riparian areas, please discuss how you will restore the site after construction including any monitoring, if necessary.*

Site will be refilled with native soils taken from trenches where a stable base is not needed. For areas where the pipeline and station are located, compacted stabilization material and gravels must be placed to maintain pipeline integrity and grade of the pump station structure. The majority of fill will be paved over with asphalt concrete pavement.

Mitigation

*Describe the reasonably expected adverse effects of the development of this project and how the effects will be mitigated.**

- * *For permanent impact to wetlands, complete and attach a Compensatory Wetland Mitigation (CWM) Plan. (See OAR 141-085-0705 for plan requirements)**
- * *For permanent impact to waters other than wetlands, complete and attach a Compensatory Mitigation (CM) plan (See OAR 141-085-0765 for plan requirements)**
- * *For permanent impact to estuarine wetlands, you must submit a CWM plan.**

It is not anticipated any wetland areas will be permanently impacted.

Mitigation Location Information (Fill out only when mitigation is proposed or required)

Proposed mitigation (check all that apply)

- ☐ *Onsite Mitigation*
- ☐ *Offsite Mitigation*
- ☐ *Mitigation Bank*
- ☐ *Payment to Provide*

Type of mitigation:

- ☐ *Wetland Mitigation*
- ☐ *Mitigation for impacts to other waters*
- ☐ *Mitigation for impacts to navigation, fishing, or recreation*

Street, Road or Other Descriptive Location	*Legal Description (attach tax lot map*)*			
	Quarter/Quarter	*Section*	*Township*	*Range*

In or near (City or Town)	*County*	*Tax Map #*	*Tax Lot #*[1]
Wetland/Waterway (pick one)	*River Mile (if known)*	*Latitude (in DD.DDDD format)*	*Longitude (in DD.DDDD format)*
Name of waterway/watershed/HUC		*Name of mitigation bank (if applicable)*	

[1] Attach a copy of all tax maps with the project area highlighted.

* ***Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.***

(6) ADDITIONAL INFORMATION

Adjoining Property Owners and Their Address and Phone Numbers *(if more than 5, attach printed labels*)*

Columbia Care Services
3587 HEATHROW WAY
MEDFORD, OR 97504
(541) 858-8170

10th St. LLC
5260 NE 22ND AVE
Portland, OR 97211
(503) 281-3595

Southwestern Oregon
PO BOX 929
Coos Bay, OR 97420
541-888-7020

Has the proposed activity or any related activity received the attention of the Corps of Engineers or the Department of State Lands in the past, e.g., wetland delineation, violation, permit, lease request, etc.?

Yes ☒ No ☐

If yes, what identification number(s) were assigned by the respective agencies:

Corps #	NWP-2010-266.	State of Oregon #	

Has a wetland delineation been completed for this site? *Yes* ☐ *No* ☒

*If yes by whom?**	*Land & Water Environmental Services is working on one for Columbia Care Services*

Has the wetland delineation been approved by DSL or the COE? *Yes* ☐ *No* ☒

*If yes, attach a concurrence letter. **

* *Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.*

(7) CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT
*(TO BE COMPLETED BY LOCAL PLANNING OFFICIAL) **

I have reviewed the project outlined in this application and have determined that:

- ☐ This project is not regulated by the comprehensive plan and land use regulations.
- ☐ This project is consistent with the comprehensive plan and land use regulations.
- ☐ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained.
  - ☐ Conditional Use Approval
  - ☐ Development Permit
  - ☐ Other

This project is not consistent with the comprehensive plan. Consistency requires a

- ☐ Plan Amendment
- ☐ Zone Change
- ☒ Other Conditional Use

An application has ☒ has not ☐ been filed for local approvals checked above.

Local planning official name (print)	Signature	Title	City / County	Date
LAURA BARRON	Laura Barron	Planning Administrator	Coos Bay	9-21-10

Comments:

(8) COASTAL ZONE CERTIFICATION *

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact the department at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
Jon Hawley	Real Estate & Development Director
Applicant Signature	Date
Jon Hawley	9/21/10

* *Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.*

(9) SIGNATURES FOR JOINT APPLICATION

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow Corps or Dept. of State Lands staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. *I understand that payment of the required state processing fee does not guarantee permit issuance. The fee for the state application must accompany the application for completeness.*

Amount enclosed	$

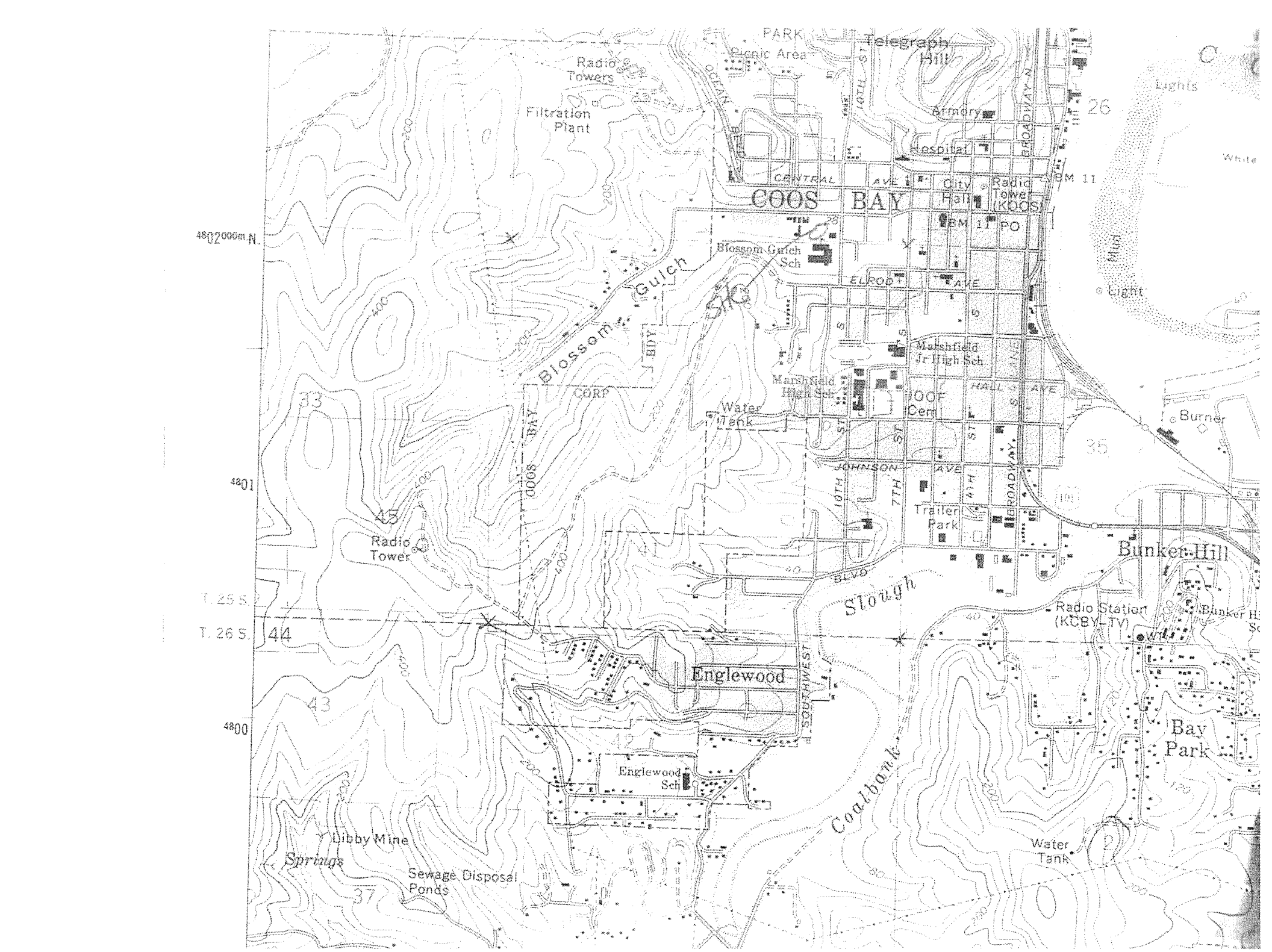
Print /Type Name	Title	Print /Type Name	Title
		Jacob B Hodge	Engineering Technician
Applicant Signature	Date	**Authorized Agent Signature**	Date
		JBHodge	8/30/2010

Landowner signatures: *For projects and /or mitigation work proposed on land not owned by the applicant, including state-owned submerged and submersible lands, please provide signatures below. A signature by the Department of State Lands for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for authorization to conduct removal/fill activities on such lands. This signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied.*

Print /Type Name	Title	Print /Type Name	Title
Property Owner Signature	Date	***Mitigation Property Owner Signature***	Date

* *Italicized areas are not required by the Corps for a complete application, but may be necessary prior to final permit decision by the Corps.*


Anderson Ave
S 10th St
S 9th St
S 8th St
Curtis Ave
© 2010 Google
Image © 2010 DigitalGlobe
Google
Imagery Date: Aug 28, 2007
eye alt 1153 ft


PARK
Picnic Area
Telegraph Hill
Radio Towers
Filtration Plant
OCEAN
10TH
BROADWAY
Armory
Hospital
CENTRAL AVE
City Hall
Radio Tower (KOOS)
BM 11
PO
COOS BAY
Blossom Gulch
Blossom Gulch Sch
ELROD AVE
Marshfield Jr High Sch
Marshfield High Sch
Water Tank
CORP
BAY
COOS
HALL AVE
IOOF Cem
JOHNSON AVE
7TH
4TH
Trailer Park
Burner
Bunker Hill
Radio Tower
SLVD
Slough
Radio Station (KCBY-TV)
Englewood
SOUTHWEST
Englewood Sch
Coalbank
Bay Park
Water Tank
Dibby Mine
Springs
Sewage Disposal Ponds
Lights
Light
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4801
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T. 25 S.
T. 26 S.
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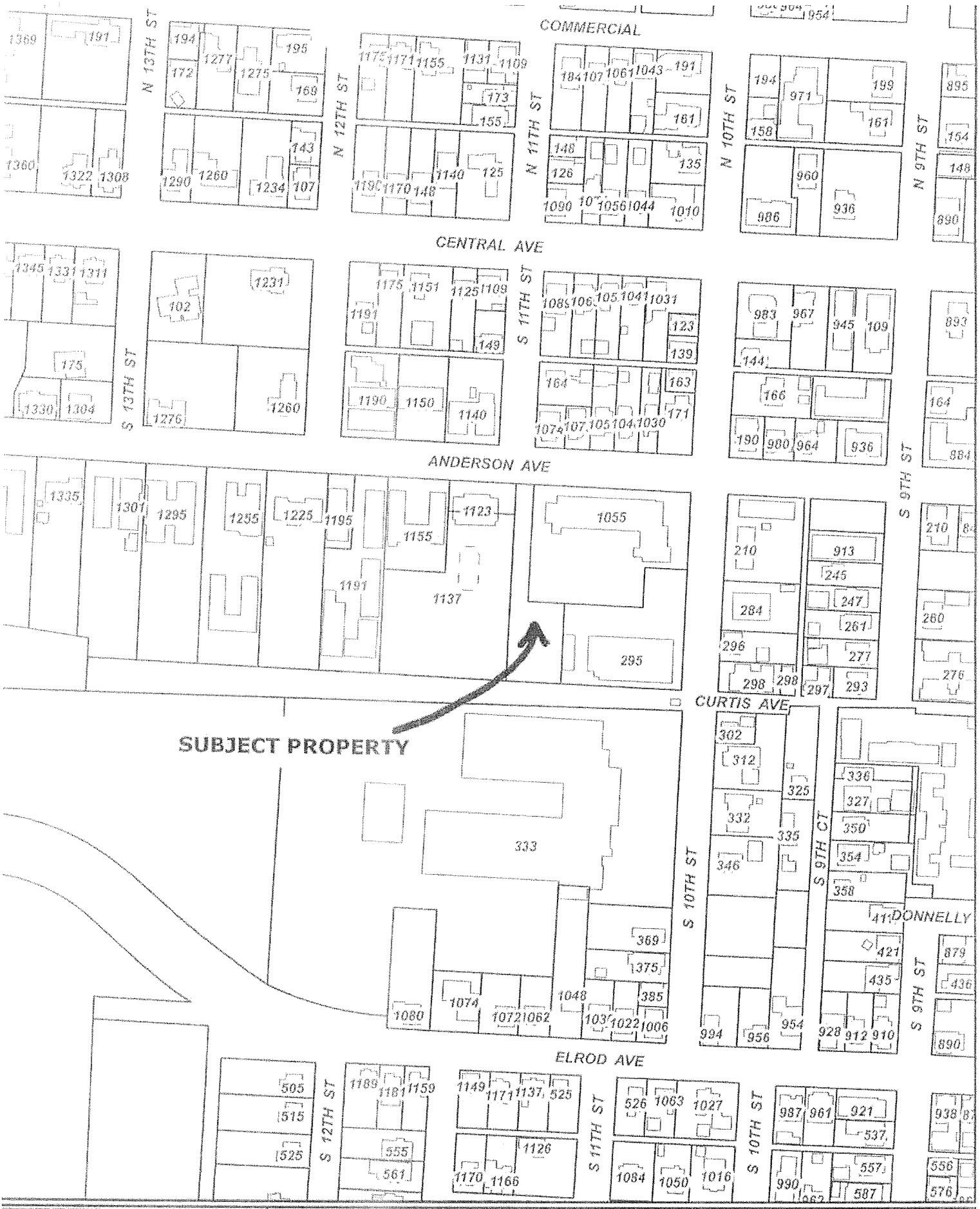

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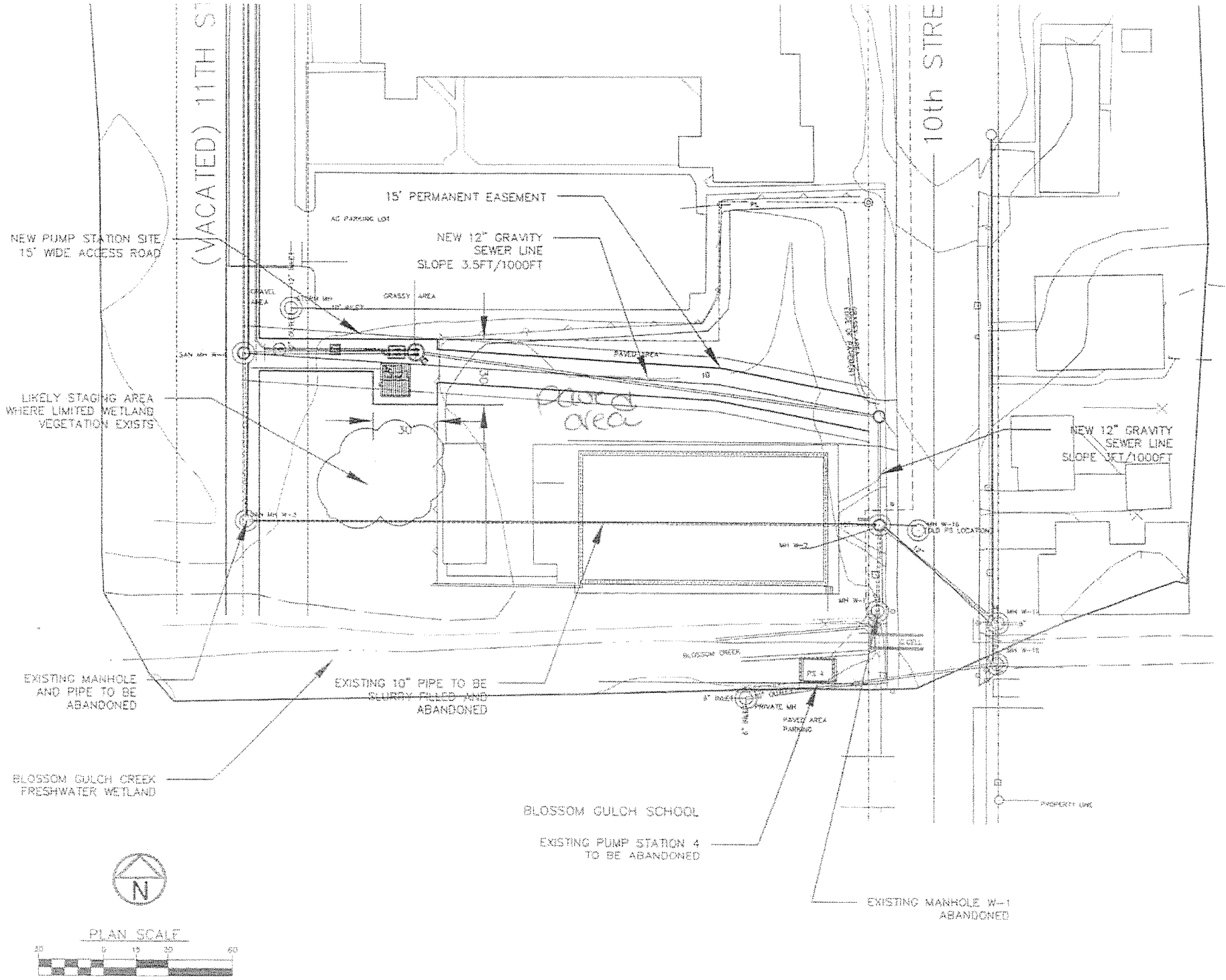
1 INCH = 203 FEET


(VACATED) 11TH ST
10th STRE
15' PERMANENT EASEMENT
NEW PUMP STATION SITE
15' WIDE ACCESS ROAD
NEW 12" GRAVITY
SEWER LINE
SLOPE 3.5FT/1000FT
LIKELY STAGING AREA
WHERE LIMITED WETLAND
VEGETATION EXISTS
NEW 12" GRAVITY
SEWER LINE
SLOPE 0FT/1000FT
EXISTING MANHOLE
AND PIPE TO BE
ABANDONED
EXISTING 10" PIPE TO BE
SLURRY FILLED AND
ABANDONED
BLOSSOM GULCH CREEK
FRESHWATER WETLAND
BLOSSOM GULCH SCHOOL
EXISTING PUMP STATION 4
TO BE ABANDONED
EXISTING MANHOLE W-1
ABANDONED
PROPERTY LINE
N
PLAN SCALE