

1194 Pacific Street, Suite 204
San Luis Obispo, CA 93401

T 805.542.9840
F 805.542.9990
www.aecom.com



Nipomo Waterline Intertie Project

Bid Package # 1: Santa Maria River Crossing

PLANS AND TECHNICAL SPECIFICATIONS
60% DESIGN—NOT FOR CONSTRUCTION



June 2009

Nipomo Waterline Intertie Project

Bid Package #1
60% Design

Nipomo Community Community Services District	
Management Staff	
General Manager	Bruce Buel
District Engineer	Peter Sevcik, PE
Utilities Superintendent	Tina Grietens

Nipomo Community Community Services District	
Board of Directors	
President	Jim Harrison
Vice President	Larry Vierheilig
Director	Cliff Trotter
Director	Ed Eby
Director	Michael Winn

AECOM	
Project Manager	Michael Nunley, PE
Engineer of Record	Cesar Romero, PE
Project Engineer	Eileen Shields, EIT
Engineering Specialist and Quality Control	Dave Arthurs, PE

AECOM Subconsultants	
Geotechnical Engineering, Survey, and Mapping	
Fugro West	Jon Blanchard, PE, GE
Wallace Group	Joe Morris, RLS
Horizontal Directional Drilling	
Jacobs Associates	Craig Camp
Permitting Support	
Padre	Eric Snelling



Nipomo Community Services District

WATERLINE INTERTIE PROJECT

**BID PACKAGE 1: SANTA MARIA RIVER CROSSING
DRAFT TECHNICAL SPECIFICATIONS
60% DESIGN – NOT FOR CONSTRUCTION
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SECTION 007300 SUPPLEMENT TO GENERAL CONDITIONS

A. Definitions

Whenever the following terms occur in the contract documents, their meaning is as follows:

CONSULTANT	AECOM USA, INC and its directors, officers, employees and subconsultants Consultant is not an agent of the District.
OWNER	Nipomo Community Services District
GOVERNING BODY	Board of Directors Nipomo Community Services District
OWNER'S REPRESENTATIVE	The authorized individual, consultant, or other entity, selected and hired by the District to perform tasks on behalf of the District during construction of the District's Project.
PROJECT	Waterline Intertie Project (WIP) – Bid Package No. 1
CONTRACTOR	The individual, partnership, corporation, joint-venture, or other legal entity with whom the District has executed the construction contract.
SPECIFICATIONS	The District's Contract Documents consisting of the General Conditions, Supplement to General Conditions, and the Construction Technical Specifications. Numbered section subjects are selected for indexing convenience only and do not indicate division of work among trades or subcontractors.

B. Terms

1. Command type sentences used in the contract documents refer to and are directed to the Contractor.
2. Terms and Conditions contained in this section prevail over the General Conditions.

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C. Authority for the Work

The drawings, specifications, and other contract documents for the work were approved and adopted by the District's Governing Body.

D. Project Reports

The following reports which have been prepared for the District are available for review at the office of the District Engineer:

1. Nipomo Waterline Intertie Project. Concept Design Report. April 2009. AECOM.
2. Geotechnical Report, Nipomo-Santa Maria Intertie, Blosser Road to Tefft Street, Nipomo Community Services District, CA., March 2009, Fugro West Inc.
3. Geotechnical Baseline Report, Nipomo Waterline Intertie Project, _____ 2009, Jacobs Associates.

E. Other Contracts

1. The Owner has awarded the following contracts for other work near the project site:
 - a. NCSD WIP - Bid Package 3: Blosser Road Water Line and Flow Meter.
 - b. NCSD WIP - Bid Package 4: Joshua Rd Pump Station and Reservoir.
2. Cooperate with the above contractors in constructing the facilities in the project herein. See Section 011100 – Coordination of Work, Permits, and Regulations.

F. Access of Owner's Representative's Personnel to Confined Spaces in Structures Under Construction

1. The Contractor shall identify confined spaces on the project, mark them with warning signs per OSHA requirements, and notify the Owner's Representative that these structures exist.
2. The Contractor shall coordinate entry operations with the Owner and Owner's Representative when the Owner's personnel and/or the Owner's Representative's personnel and the Contractor's personnel will be working in or near permit-required confined spaces.
3. The Contractor shall provide personnel and equipment, including standby personnel, observers, and authorized competent person to stand by while entrants are inside the space, temporary ventilation equipment, or self-

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contained breathing apparatus, to assist the personnel of the Owner's Representative in obtaining access to permit-required confined spaces

4. The Contractor shall provide the following assistance to the personnel of the Owner's Representative when said personnel must enter confined spaces in structures under construction or structures which have not been accepted by the Owner.
 - a. Training program for the Owner's Representative's personnel relevant to the specific structures being entered.
 - b. Testing equipment and personnel to operate said equipment for testing the atmosphere in the confined spaces for oxygen deficiency, explosive gases, and toxic gases.
 - c. Authorized competent person to stand by each confined space while entrants are inside the space.
 - d. Safety equipment (breathing apparatus, harnesses, and rescue equipment) in good working order.
 - e. Communication equipment.
 - f. Access equipment (hoists and ladders).
 - g. Signs.
 - h. Alarm system.
 - i. Ventilation system.

G. Utilities

The Consultant has endeavored to determine the existence of utilities along the project alignment from the records of owners of known utilities in the vicinity of the work. The positions of these utilities as derived from such records are shown on the plans. Note, service laterals and connections are not all shown on the plans. The Contractor is responsible for locating, protecting, and maintaining the operation of all existing utilities (including service laterals).

Prior to beginning work, the Contractor shall conduct his own utility investigation to field locate and determine the true horizontal and vertical locations of existing subsurface utilities in the vicinity of the project. The Contractor shall field locate and expose underground utilities by potholing or other acceptable non-destructive methods.

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If the Contractor discovers conflicting utility facilities not identified in the plans or specifications or in a position different from that shown in the plans and specifications, he shall immediately notify by phone and in writing the Owner's Representative and the owner of the utility facility.

See Specification Section **XXXXX** of the General Conditions for requirements and procedures regarding the removal, relocation, protection, and temporary maintenance of utility facilities not identified in the Contract Documents.

H. Safety

The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the work, and the Contractor shall fully comply with all state, federal and other laws, rules, regulations, and orders relating to safety of the public and workers.

The right of the Owner or the Owner's Representative to conduct construction review or observation of the Contractor's performance will not include review or observation of the adequacy of the Contractor's safety measures in, on, or near the construction site.

Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of and shall provide the necessary protection to prevent damages, injury, or loss to: (1) all persons on the Site or who may be affected by the Work; (2) all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and (3) other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and underground facilities not designated for removal, relocation, or replacement in the course of construction. Contractor shall comply with all applicable laws and regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of underground facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

I. California and Local Regulations

1. The Contractor is solely responsible for accomplishing all work in a safe manner, complying with, but not limited to, the following regulations:
 - a. CAL/OSHA, Title 8, Industrial Relations, Chapter 4, division of Industrial Safety Orders, Subchapter 4, Construction Safety Order.
 - b. Title 8, CCR, General Industrial Safety Orders (GISO), Section 5156, Scope & Definitions, and Section 5159, Confined Space Operations.

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- c. Title 8, CCR, Construction Safety Orders, Article 4, Sections 1528 to 1531, Dusts, Fumes, Mists, Vapor, and Gases.
2. Contractor shall submit a notarized letter signed by a principal officer of the corporation or company certifying the Contractor fully complies with California Code of Regulations pertaining to the Construction Safety Orders (CSO) and General Industry Safety Orders (GISO). Review of Contractor's safety plan by Engineer does not imply that District accepts responsibility for such plans or safety activities.

J. Worker Protection

1. Conform to all federal, state, county, and District safety and environmental protection codes and regulations. Do not create conditions for which the District is subject to citations by any regulatory agency. Should the District be cited for a condition under the control of the Contractor, the Contractor will be responsible for payment and settlement of said citation. All safety equipment, including that for confined space entry, shall be provided by the Contractor at his expense, including safety equipment necessary for use by the Owner's Representative.
2. Comply with all applicable regulations for properly storing, handling, transporting, and disposing of any hazardous waste.
3. Maintain a full-time standby hole watch in case of an emergency. This employee shall be certified in CPR and have confined space certification and shall be able to comply with GISO 5157 (Operating Procedures and Employee Training) and GISO 5158 (Pre-Entry). This employee shall also be fully equipped to operate within the directives of GISO 5159 (Confined Space Operations). This person shall have his own personal safety equipment and operating telephone (not the jobsite telephone).

K. Excavation Sheeting, Shoring, and Bracing Plans for Worker Protection Required by Labor Code Section 6705

The Contractor shall submit to the Owner's Representative for acceptance, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation. The plan shall be prepared by a registered civil or structural engineer. As a part of the plan, a note shall be included stating that the registered civil or structural engineer certifies that the plan complies with the CAL/OSHA Construction Safety Orders, 29CFR1926 Subpart P-Excavations, or that the registered civil or structural engineer certifies that the plan is not less effective than the shoring, bracing, sloping, or other provisions of the Safety Orders.

The Owner or their consultants may have made investigations of subsurface conditions in areas where the work is to be performed. If so, these investigations

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are identified in the Contract Documents and the records of such investigations are available for inspection at the office of the District Engineer. The detailed plan showing the design of shoring, etc., which the Contractor is required to submit to the Owner's Representative for acceptance in advance of excavation will not be accepted by the District if the plan is based on subsurface conditions which are more favorable than those revealed by the investigations made by the District or their consultants; nor will the plan be accepted if it is based on soils-related design criteria which is less restrictive than the criteria set forth in the report on the aforesaid investigations of subsurface conditions.

The detailed plan showing the design of shoring, etc., shall include surcharge loads for nearby embankments and structures, for spoil banks, and for construction equipment and other construction loadings. The plan shall indicate for all trench conditions the minimum horizontal distances from the side of the trench at its top to the near side of the surcharge loads.

Nothing contained in this article shall be construed as relieving the District's Contractor of the full responsibility for providing shoring, bracing, sloping, or other provisions which are adequate for worker protection.

L. Personal Liability

No director, officer, employee, or agent of the Owner, the Consultant, the Owner's Representative, or their consultants shall be personally responsible for any liability arising under or by virtue of the contract.

M. Indemnity

1. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, the Consultant, the Owner's Representative, and their consultants, and each of their directors, officers, agents, and employees from and against all claims, damages, losses, expenses, and other costs, including costs of defense and attorneys' fees, arising out of or resulting from or in connection with the performance of the Work, both on and off the jobsite, provided that any of the foregoing (1) is attributable to personal injury, bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and (2) is caused in whole or in part by any act or omission of the Contractor, any subcontractor, any supplier, anyone directly or indirectly employed by any of them or anyone for whose acts or omissions any of them may be liable, regardless of whether or not caused in part by any act or omission (active, passive, or comparative negligence included) excepting only the indemnitee's sole negligence or willful misconduct.
2. In any and all claims against the indemnified parties by any employee of the Contractor, any subcontractor, any supplier, anyone directly or indirectly

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employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under the first and fourth paragraphs in this article on INDEMNITY shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable, by or for the Contractor, or any subcontractor, or any supplier, or other persons under workers' compensation acts, disability benefit acts, or other employee acts.

3. The obligations of the Contractor under the first and fourth paragraphs in this article on INDEMNITY shall not extend to the liability of the Consultant, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents, arising out of or resulting from or in connection with the preparation or approval of maps, drawings, opinions, reports, surveys, designs or specifications, providing that the foregoing was the sole and exclusive cause of the loss, damage, or injury.
4. The Contractor shall also indemnify and hold harmless the Owner, the Consultant, the Owner's Representative, and their consultants, and each of their directors, officers, employees, and agents from and against all losses, expenses, damages (including damages to the Work itself), attorneys' fees, and other costs, including all costs of defense, which any of them may incur with respect to the failure, neglect, or refusal of Contractor to faithfully perform the Work and all of the Contractor's obligations under the contract. Such costs, expenses, and damages shall include all cost, including attorneys' fees, incurred by the indemnified parties in any lawsuit to which they are a party.

N. Construction Survey Staking

When the Contractor requires construction survey staking or marks, the Contractor shall notify the Owner's Representative of his requirements in writing at least ten (10) working days in advance of starting operations that require such stakes or marks.

END OF SECTION

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SECTION 011100 COORDINATION OF WORK, PERMITS, AND REGULATIONS

A. Related Specifications

1. General Conditions
2. Supplement to General Conditions: 007300.
3. Mitigation Monitoring Compliance and Reporting: 011160.
4. Construction Facilities and Temporary Controls: 015100

B. Description

This section generally describes the project and includes work by others, work sequence and schedule, Contractor's use of premises, construction survey staking, permits, and regulations.

C. General Nature of Work

The work involves construction of a 30-inch outside diameter (O.D.), approximately 2,635 linear feet long potable water pipeline crossing underneath the Santa Maria River. The method of construction primarily involves the use horizontal directional drilling with some open-cut trench installation at both ends of the PROJECT.

D. Location of Project Site

The PROJECT site is located between the City of Santa Maria, Santa Barbara County, and the town of Nipomo, San Luis Obispo County. The PROJECT begins within the Santa Maria River, just north of the Santa Maria River levee, and ends on the Nipomo Mesa as shown on the drawings.

E. Work by Others

1. The following construction contracts are planned by the Owner which may restrict access to and full use of the site:

NCSD WIP - Bid Package 3: Blosser Road Water Line and Flow Meter.

NCSD WIP - Bid Package 4: Joshua Rd Pump Station and Reservoir.

2. The following construction project planned by others may restrict access to and full use of the site:

US Army Corps of Engineers, Los Angeles District, in cooperation with Santa Barbara County Department of Public Works, Santa Maria Valley

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Levees, South Levee Improvement (Reach 1, Blosser Road to U.S. Highway 101).

The South Levee Improvement – Reach 1, involves overexcavation of the existing levee tow, northward approximately 110-ft to the County's Right-of-way limits. The maximum excavation depth will reach approximately 23-feet below existing grade within the river. The proposed improvements will include a stepped soil cement layer placed on the face of the levee down to the new toe, at the full excavated depth. Heavy excavation, temporary spoils storage, and miscellaneous heavy equipment will be required for construction of the South Levee Improvement – Reach 1 project, and may conflict with site access for the PROJECT Contractor.

(Note to Plan Reviewer: Schedule conflict to be confirmed pending final review comments and construction schedule update from SB County and USACE)

3. With respect to work by others, the Owner will require that:
 - a. The PROJECT Contractor shall coordinate with Contractors for other noted Bid Packages for site access, site laydown, and overall use of sites within the Santa Maria River bed and on the Nipomo Mesa.
 - (1) Details to be determined and coordinated with BP-3 and BP-4 Tech Specifications...
 - b. The PROJECT Contractor shall coordinate with Contractor(s) for the Santa Maria Valley South Levee Improvement project for site access, site laydown, and overall use of site within the Santa Maria River bed.
 - (1) Contractor shall conform to requirements and limitations set forth in the Santa Barbara County and USACE issued permits for work within and near the Santa Maria River and Levee. See Appendix A – Permits.
 - (2) Add'l requirements to be determined, pending final review comments and construction schedule update from SB County and USACE.
4. In case of conflict in site use, see: Section XXXX, General Conditions.

F. Work Schedule and Constraints

1. Site disturbance and construction activities shall occur during the dry season, April 15th through November 15th. No construction activities shall occur during or immediately following a rain event, or if water is flowing within the Santa Maria River.

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2. A qualified biologist, provided by the Owner, will conduct pre-construction surveys and worker orientation before initiation of any construction activity.
3. A qualified biologist, provided by the Owner, shall be onsite during all vegetation clearing and shall periodically monitor construction activities.
4. See Specification Section 011160 Mitigation Monitoring Compliance and Reporting for specific permit and regulation requirements.

G. Contractor's Use of Premises

1. Project construction shall be coordinated with property owners and any farm lessee/operators. Impacts to agricultural use of the property shall be avoided or minimized per the following:
 - a. Locate all existing irrigation systems in order to avoid damage to buried irrigation lines, wells, risers, or other agricultural infrastructure.
 - b. Provide early notice of any planned closures or detours on existing roadways either within the fields or along existing paved roads with regular updates about forthcoming closures or detours to area agricultural producers.
2. All equipment staging and construction crew parking areas shall be located within pre-designated staging areas identified on the contract drawings. All construction access routes shall be established in previously disturbed areas.
3. Provide adequate signage, barriers, and flagmen, if necessary, in order to insure the safe diversion of traffic, bicyclists, and/or pedestrians. Ensure continued adequate access from/to adjacent properties.
4. Install exclusionary and silt fencing along the boundaries of the construction areas, as determined by an Owner-provided qualified biological monitor. The fencing shall remain in place throughout the construction phase.
5. If nighttime construction activities are warranted and approved by Owner, shield wildlife habitat and open sky from equipment lighting to minimize lighting/glare impacts to wildlife while still providing safe working conditions for construction personnel.
6. At no time shall any equipment and/or materials staging be allowed within the beds or banks of the Blosser Road drainage canal.
7. Install temporary berms and sedimentation traps per Specification Section 011160 to minimize erosion of soils and sedimentation into the Santa Maria River. Clean sedimentation traps periodically with silt removal and dispose in a location approved by the Owner.

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8. All project construction activities shall comply with the County of San Luis Obispo Noise Ordinance Section 22.06.042(d). Noise-generating construction activities shall be limited to the hours between 7:00 am and 9:00 pm on weekdays and 8:00 am and 5:00 pm on Saturdays and Sundays. Refer to Section 011160 for additional noise restrictions.
9. During construction implement air pollution mitigation measures per San Luis Obispo Air Pollution Control District (APCD) and Santa Barbara APCD requirements. See Specification Section 011600 for details.

H. Construction Survey Staking

See Section 015100.

I. Permits

1. The following permits for the permanent work have been obtained by the Owner; See Section 011160 for associated Mitigation Monitoring requirements:
 - a. State of California, Department of Industrial Relations, Division of Occupational Safety and Health (DOSH), Mining and Tunneling Unit, a Preliminary Tunnel Classification; a copy of which is included herein as Appendix A.
 - b. State of California Department of Public Health Domestic Water Supply Permit Amendment for changes to the water system and supply.
 - c. California Department of Fish & Game, Streambed Alteration Agreement permit, a copy of which is included herein as Appendix A.
 - d. US Army Corps of Engineers (USACOE) Section 404 Permit; a copy of which is included herein as Appendix A
 - (1) Note to plan reviewer: this permit may not be required, pending outcome of submittal of Preliminary Jurisdictional Determination Request Form.
 - e. NPDES discharge permit for discharging water for pressure testing, leakage testing, and disinfection into _____.
 - f. SLO County APCD Permits for Construction.
 - g. Santa Barbara County APCD Permits for Construction.
2. The Owner has or will have submitted a Notice of Intent to Discharge, along with appurtenant fee, under the Construction Activities Storm Water General

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Permit (99-08-DWQ). Under this permit the Contractor must prepare and submit a Storm Water Pollution Prevention Plan per General Conditions Section [_____].

- Contractor shall obtain and pay the fees for the following permits. Contact the permitting agencies listed below for current fees associated with each permit.

Name or Type of Permit	Name, Address, Telephone Number of Permitting Agency
State of California, Department of Industrial Relations, Division of Occupational Safety and Health (DOSH): Permit for Trenching/Excavations Exceeding 5-feet in depth	CAL/OSHA Field Office Ventura County 1655 Mesa Verde, Room 125 Ventura, CA. 93003 (805) 654-4581
State of California, Department of Industrial Relations, Division of Occupational Safety and Health (DOSH), Mining and Tunneling Unit: Certification of safety representatives for underground tunneling operations	Cal/OSHA Mining and Tunneling Unit 2211 Park Towne Circle, Ste. 2, Sacramento, CA 95825 (916) 574-2540
NPDES dewatering and discharge permit for discharging water for pressure testing, leakage testing, and disinfection [into the [_____] storm drain]	Regional Water Quality Board, Central Coast Region 895 Aerovista Place, Suite 101 San Luis Obispo, CA 93401-7906 (805) 549-3147
State Water Resources Control Board (SWRCB) – Construction Activities Storm Water General Permit [(99-08-DWQ)] [_____] (SWPPP)	State Water Resources Control Board PO Box 100 Sacramento, CA 95812-0100 (916) 341-5536
City of Santa Maria Encroachment Permit	Details pending / To be completed
County of San Luis Obispo Encroachment Permit	Details pending / To be completed
County of Santa Barbara Encroachment Permit	Details pending / To be completed
Construction Water Permit for water obtained from District and/or City of Santa Maria owned fire hydrants	To be completed

- The permits contain requirements that affect the cost of project work and some permanent permits require supplementary work permits and fees to execute construction. Comply with the permit requirements and obtain and pay the fees involved with the supplementary work permits.

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J. Rights-of-Way

The construction activities shall be limited to public rights-of-way, temporary construction easements, and permanent utility easements shown on the drawings, unless additional arrangements are made with adjacent property owners. These public rights-of-way, temporary easements, and permanent easements shown on the drawings collectively constitute the work area. The Contractor will not be allowed to acquire additional land for construction of the project without consultation and coordination with the Owner. The Contractor shall also coordinate with and obtain the support of residents living or doing business in the immediate area of such land acquisitions. See Appendix A for easement descriptions.

K. Cultural Resources

1. A qualified archaeologist shall be retained and paid by the Contractor to conduct a preconstruction archeological workshop in order to inform construction personnel about common types of artifacts that may be uncovered during construction and the reporting requirements and responsibilities of construction personnel.
2. All ground disturbing construction activities on and adjacent to significant sites will be monitored by a qualified archaeologist. In the unlikely event that unexpected archaeological resources are discovered during construction, all construction activities shall be halted in the area until the significance of the finding is evaluated by a qualified archaeologist and appropriate recommendations made pursuant to County Land Use Ordinance Section 22.0.
3. During construction activities, the archaeologist shall have the authority to temporarily divert or direct earthmoving to allow time to evaluate any exposed prehistoric or historic material. In accordance with Public Resources Code 5097.94, if human remains are found, the County coroner must be notified within 24 hours of the discovery. If the coroner determines that the remains are not recent, the coroner will notify the Native American Heritage Commission in Sacramento to determine the most likely descendent for the area. The designated Native American representative shall then determine in consultation with the property owner the disposition of the human remains.]

END OF SECTION

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SECTION 011160 MITIGATION MONITORING COMPLIANCE AND REPORTING

A. Environmental Controls

Comply with the following environmental controls.

1. Dust Control:

a. Implement the following dust control measures during all ground disturbance and construction activities:

- (1) Use water trucks or sprinkler systems in sufficient quantities to prevent airborne dust from leaving the construction site. Increased watering frequency will be required whenever wind speeds exceed 15 mph. Reclaimed water, if available, shall be used for dust control and other construction-related purposes during project construction. Indicate the source of reclaimed water to be used for dust control.
- (2) All material excavated or graded shall be sufficiently watered to prevent excessive amounts of dust. Watering shall occur at least twice a day with complete coverage, preferably in the late morning and after work is done for the day.
- (3) Designate a person or persons to monitor the dust control program and to order increased watering, as necessary, to prevent transport of particulate matter off site. Their duties shall include holidays and weekend periods when work may not be in progress. The name and telephone number of such persons shall be provided to the APCD prior to construction.
- (4) All disturbed soil areas not subject to revegetation, including soil stockpiles, shall be stabilized using approved chemical soil binders, jute netting or other methods approved by the APCD with jurisdiction.
- (5) Vehicle speed for all construction vehicles shall not exceed 15 mph on any unpaved surface at a construction site.
- (6) Where vehicles enter and exit unpaved roads onto streets, install wheel washers or gravel pads or wash all trucks and equipment when leaving site.
- (7) Sweep streets at the end of each day if visible soil material is carried onto adjacent paved roads.

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- (8) Trucks transporting fill material to and from the site shall be tarped or maintain at least two feet of freeboard.

2. Air Quality Control:

- a. In addition to the above mentioned Dust Control measures, Implement the following air quality control measures during all construction activities:

- (1) Prior to project grading, a geologic analysis shall be performed in order to determine if asbestos-bearing serpentine rock is present. If naturally occurring asbestos is found at the project site, an Asbestos Health and Safety Program and an Asbestos Dust Control Plan shall be submitted to the Air Pollution Control District for review and approval prior to project grading.
- (2) All off-road and portable, diesel-powered equipment, including, but not limited to, bulldozers, grading, cranes, loaders, scrapers, backhoes, generator sets, compressors or auxiliary power units, shall be fueled exclusively with CARB motor vehicles diesel fuel. Such equipment shall be stored within a fenced enclosure during non-working hours in order to minimize potential vandalism.
- (3) Diesel equipment used in proposed horizontal directional drilling shall either be certified pursuant to the California Air Resources Board's Portable Equipment Registration Program or will be subject to an Authority to Construct issued by the San Luis Obispo County Air Pollution Control District (APCD). This permit will allow implementation of Best Available Control Technologies including diesel particulate filters and/or proper fuel selection.
- (4) Where possible, diesel powered equipment shall be replaced with gasoline, electrical, CNG or LPG powered equipment.

3. Site Restoration on non-agricultural land:

All disturbed, non-agricultural soils within the Santa Maria River shall be stabilized with vegetation upon completion of construction. Implement site restoration per the Revegetation Plan and requirements contained within the --- Permit (copies included in Appendix A). At a minimum, work shall include:

- a. Note to Reviewer: Details to be determined pending conditions of approval from USF&G SAA agreement

4. Site Restoration on Prime Farmland:

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For excavation and construction staging/storage on prime farmland, implement, at a minimum, the following measures to avoid potential permanent impacts to soil resources:

- a. Place a geotextile membrane on top of native soils prior to the placement of any stockpile, fill, base materials or construction materials.
- b. Stockpile all excavated soils in a manner that protects the soils' physical, chemical and biological characteristics. Biologically active topsoil (A horizon) shall be segregated from deeper soils during construction.
- c. At the conclusion of construction, native soils shall be replaced in a manner that mimics the pre-construction characteristics of the soils, including compacting the soils to the same soil permeability, soil texture and available water holding capacity
- d. See Section E – Geology and Soils.

B. Protection of Surface and Ground Water

1. Construction across the Santa Maria River shall occur in the dry season, April 15th through November 15th, when there is little or no flow in the River. No construction activities shall occur during or immediately following a rain event, or if water is flowing within the Santa Maria River.
2. Comply with the Project Frac-out Monitoring, Response, and Clean-up Plan for horizontal directional drilling operations within the Santa Maria River channel. Copy include herein in **Appendix A**. This plan includes:
 - a. Measures for containment of spills
 - b. Required regulatory agency notifications
 - c. Clean-up protocols
 - d. Procedures for restoring the river channel to pre-disturbance conditions
 - e. Conditions by which the boring operation would be abandoned, if applicable, and how many repeated bores may be attempted.
3. The Owner's Biological Monitor will conduct field inspections of horizontal directional drilling operations, reporting, and enforcement of all applicable conditions of approval, including any required conditions from the California Department of Fish and Game SAA. The Owner's Biological Monitor will be on-site to inspect the river corridor and pipeline alignment during drilling

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activities that have the potential for a spill or “Frac-out” (i.e. pull back operations, etc.) to ensure no impacts occur to the Santa Maria River. In the event of a spill or “Frac-out” within the Santa Maria River corridor, all work shall be halted and the spill shall be contained using the procedures outlined above for the Project Frac-out Monitoring, Response, and Clean-up Plan.

4. Monitor drilling pressures to ensure they do not exceed those needed to penetrate the formation. See Section 330525 – Horizontal Directional Drilling.
5. Prior to beginning work, prepare a storm water pollution prevention plan (SWPPP) for construction and submit to the RWQCB in compliance with the statewide General Construction Activity Storm Water Permit. See Part E.2 of this Specification for requirements.
6. Install temporary berms and sedimentation traps, such as silt fencing, straw bales, and sand bags, to minimize erosion of soils and sedimentation into the Santa Maria River. Sedimentation traps shall be cleaned periodically with silt removal and disposal in a location approved by the Owner.

C. Biological Resources

1. Site disturbance and construction activities are limited to the dry season, April 15th through November 15th, and no construction or site disturbance shall occur during or immediately after a rain event.
2. The Owner’s Biological Monitor will conduct field inspections of horizontal directional drilling operations, reporting, and enforcement of all applicable conditions of approval, including any required conditions from the California Department of Fish and Game SAA. The Owner’s Biological Monitor will be on-site to inspect the river corridor and pipeline alignment during drilling activities that have the potential for a spill or “Frac-out” (i.e. pull back operations, etc.). In the event of a spill or “Frac-out” within the Santa Maria River corridor, all work shall be halted and the spill shall be contained using the procedures outlined above for the Project Frac-out Monitoring, Response, and Clean-up Plan.
3. The Owner’s qualified Biological Monitor will conduct pre-construction surveys and worker orientation before initiation of any construction activity. Should special-status or threatened species be identified, the Biological Monitor will consult with the appropriate authority for relocation protocol, and construction activities may be delayed as necessary.
4. The drawings designate “sensitive resource zones.” Sensitive resource zones are defined as areas where construction would be limited in space, time, or methods to minimize or avoid impacts to special status species or their habitat.

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5. All construction workers (including site supervisors, equipment operators, laborers and subcontractors) shall attend a worker orientation to area special-status species and applicable regulatory policies provided by the Owner's Biological Monitor.
6. Limit all equipment staging and parking areas to pre-designated areas, as shown in the drawings. All construction access routes shall be limited to previously disturbed areas and/or existing roadways.
7. Erect exclusionary and silt fencing at the boundaries of construction areas and other locations, as directed by the Owner's Biological Monitor.
8. If nighttime construction activities are warranted and approved by the Owner, all equipment lighting shall be shielded away from wildlife habitat areas and open sky to minimize lighting/glare impacts to wildlife while still providing safe working conditions for construction personnel.
9. Implement a dust control program during construction (See Part 1.A for requirements).
10. The Owner's Biological Monitor shall be onsite during all vegetation clearing, and shall periodically monitor the project area during construction activities.
11. Spill containment equipment shall be available on site during all construction activities. As necessary, this shall include placement of individual spill response trailers at each active work area during project operations.
12. In addition to the above mitigation measures, comply with the following:
 - a. Nesting of Protected Migratory Birds and Raptors – For construction activities scheduled between February 15th and September 15th, The Owner's Biological Monitor shall conduct preconstruction surveys two (2) weeks prior to initiation of work to identify potential bird nesting sites.
 - (1) If active nest sites of common bird species protected under the Migratory Bird Treaty Act and Fish and Game Code Sections 3503 and 3503.5 are observed within 300 feet of construction activities, then the project shall be modified and/or delayed as necessary to avoid direct take of the identified nests, eggs, and/or young.
 - (2) If active nest sites of raptors and/or species of special concern are observed within the vicinity of project construction activities, construction shall avoid the nest site or be terminated until the California Department of Fish and Game is contacted and an appropriate buffer zone around the nest site is established. Construction activities in the buffer zone shall

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be prohibited until the young have fledged the nest or the nest is abandoned.

- b. Special Status Aquatic and Semi-Aquatic Species - The following measures are required to protect aquatic and semi-aquatic special status species:
 - (1) All work areas within 100 feet of known California red-legged frog (CRLF) habitat shall be surveyed by the Owner's Biological Monitor, each day prior to the initiation of construction activities.
 - (2) In the event CRLF is identified in the work area, all work shall cease until the CRLF has safely vacated the work area. At no time shall any CRLF be relocated and/or affected by project operations without prior approval from the US Fish and Wildlife Service (USFWS).
 - (3) Install silt fencing around temporary aquatic habitat that have formed during project activities (i.e., trenches that have perched groundwater, etc) to minimize potential for CRLF migration into project site. The location of exclusionary and silt fencing shall be determined by the Owner's Biological Monitor.
- c. Special Status Plant Species – The following measures are required to protect special status plant species
 - (1) Prior to construction, the Owner's qualified botanist, shall complete a focused botanical survey of the pipeline alignment along the southern boundary of the Santa Maria River. All Blochman's ragwort identified within 50 feet of the proposed horizontal directional drilling laydown area and pipeline alignment shall be marked with a temporary flag.
 - (2) Protective fencing shall be installed around populations of Blochman's ragwort to prevent loss of this special-status species. As necessary, this shall include minor modifications of the designated horizontal directional drilling laydown area to avoid Blochman's ragwort to the extent feasible.

D. Cultural Resources

- 1. A qualified archaeologist will conduct preconstruction archeological workshop in order to inform construction personnel about common types of artifacts that may be uncovered during construction and the reporting requirements and responsibilities of construction personnel.

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2. All ground disturbing construction activities on and adjacent to significant sites will be monitored by a qualified archaeologist. In the unlikely event that unexpected archaeological resources are discovered during construction, all construction activities shall be halted in the area until the significance of the finding is evaluated by a qualified archaeologist and appropriate recommendations made pursuant to County Land Use Ordinance Section 22.0.

E. Geology and Soils

1. For excavation and construction staging/storage on prime farmland, implement, at a minimum, the following measures to avoid potential permanent impacts to soil resources:
 - a. Place a geotextile membrane on top of native soils prior to the placement of any stockpile, fill, base materials or construction materials.
 - b. Stockpile all excavated soils in a manner that protects the soils' physical, chemical and biological characteristics. Biologically active topsoil (A horizon) shall be segregated from deeper soils during construction.
 - c. At the conclusion of construction, native soils shall be replaced in a manner that mimics the pre-construction characteristics of the soils, including compacting the soils to the same soil permeability, soil texture and available water holding capacity
2. The following erosion control protocol shall be followed in association with pipeline construction:
 - a. In compliance with the San Luis Obispo County Land Use Ordinance, the District prepared an Erosion and Sedimentation Control Plan (ESCP) outlining the measures to address both temporary (i.e., site disturbance, stock piling and horizontal directional drilling activities) and final (i.e., post-construction) methods for stabilizing soil and minimizing soil loss from the proposed project site. A copy of the ESCP is included in **Appendix A**. All measures shall be adhered to throughout the project duration.
 - b. Prior to any work beginning, prepare a project-specific storm water pollution prevention plan (SWPPP) for construction and submit to the RWQCB in compliance with the statewide General Construction Activity Storm Water Permit. The SWPPP shall include provisions for the installation and maintenance of Best Management Practices to reduce the potential for erosion of disturbed soils at the project site. This plan shall be designed for **(to be determined storm event)**.

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- c. In order to minimize erosion of soils and sedimentation into the Santa Maria River and other local drainages during project excavations and underground horizontal directional drilling activities, construct temporary berms and sedimentation traps or basins. Temporary berms and sedimentation traps may be constructed from silt fencing, straw bales lined with filter fabric, and/or sand bags. Sedimentation basins and traps shall be cleaned periodically with silt removal and disposal in a location approved by the District. These basins shall be constructed prior to dewatering and regularly maintained during construction, including after storm events, to remain in good working order.
- d. Construct straw bale/filter fabric barriers, backed by wire fencing for strength, around spoil piles to contain sediment from runoff. These barriers shall be installed immediately after stockpiling during the dry season and shall be regularly maintained until the stockpiles are completely removed.

F. Hazards and Hazardous Materials

1. Prepare a Spill Contingency Plan (SCP) outlining measures to prevent the release of petroleum and hazardous materials including containment methods for emergency clean-up operations. Prevention and contingency measures shall include, but not be limited to:
 - a. Identification of appropriate fueling areas away from sensitive habitat areas such as swales and/or drainages
 - b. Preparation of maintenance schedule for equipment, and a list of appropriate containment and spill response materials to be stored on-site.
 - c. Spill containment equipment shall be available on-site during all construction activities. As necessary, this shall include placement of individual spill response trailers at each active work area during project operations.
 - d. All vehicles shall be staged only in appropriately marked and protected areas and at no time shall any cleaning and/or refueling of equipment be allowed upslope and/or within the vicinity of any drainages and/or wetland habitat areas, including agricultural stock ponds.
 - e. If an accidental spill of a hazardous or toxic material occurs, the Regional Water Quality Control Board (RWQCB), the California Department of Fish and Game and California Department of Toxic Substances Control (DTSC) shall be notified.
2. Comply with the Frac-Out Monitoring, Response, and Contingency Plan at all times (See Part 1.B of this Specification).

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3. If an accidental spill of hazardous or toxic material occurs, immediately notify the Regional Water Quality Control Board, the California Department of Fish and Game, the California Department of Toxic Substances, and the Owner.
4. The following pollution prevention measures shall be followed in association with pipeline construction:
 - a. If rain occurs during or within three days after concrete is placed for any pipeline structures, spread and secure plastic sheets or tarps over the concrete in such a manner to prevent rain from coming in contact with the concrete.
 - b. Wash out concrete trucks in a designated area where the material cannot run off into the stream or percolate into the groundwater. This area shall be identified in the submitted SWPPP and shall be in place before any concrete is poured.
 - c. Upon entering the site and regularly thereafter, equipment shall be inspected and maintained prior to working in or immediately adjacent to the Santa Maria River. Any leaks or hoses/fittings in poor condition shall be repaired before the equipment begins work.

G. Noise

1. Comply with County of San Luis Obispo Noise Ordinance Section 22.06.042(d). Noise-generating construction activities shall be limited to the hours of 7:00 am through 9:00 pm during weekdays and between 8:00 am and 5:00 pm on Saturdays and Sundays.
2. All construction equipment utilizing combustion engines shall be equipped with "critical" grade (rather than "stock" grade) noise mufflers that are in good condition. Tune back-up beepers to insure lowest possible noise levels.
3. All necessary measures to muffle, shield or enclose construction equipment shall be implemented in order to insure that noise levels at the property line of the nearest residence do not exceed an exterior noise level of 60 dBA. During project a qualified acoustical engineer shall conduct construction noise monitoring in order to insure the acceptable noise threshold of 60 dBA at the property line of the nearest sensitive receptor.

H. Transportation and Circulation

At all construction sites accessing onto or occurring adjacent to public roadways, provide adequate signage, barriers, and, if necessary, flagmen in order to insure the safe diversion of traffic, bicyclists, and/or pedestrians. Insure continued access from adjacent properties to local roadways.

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END OF SECTION

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SECTION 012000 MEASUREMENT AND PAYMENT

A. Work Listed in the Schedule of Work Items

1. Work under this contract will be paid on a unit price or lump-sum basis as outlined on the Bid Form and described below for the quantity of work installed.
2. The unit prices and lump-sum prices include full compensation for furnishing the labor, materials, tools, equipment, submittals, and incidentals, and doing all the work involved to complete the work included in the contract documents.
3. The application for payment will be for a specific item based on the percentage completed or quantity installed. The percentage complete will be based on the value of the partially completed work relative to the value of the item when entirely completed and ready for service.

B. Work Not Listed in the Schedule of Work Items

1. The General Conditions, Supplement to General Conditions, and items in the General Requirements, Construction Technical Specifications, and Drawings, which are not listed in the schedule of work items of the Bid Form are, in general, applicable to more than one listed work item, and no separate work item is provided therefor. Include the cost of work not listed but necessary to complete the project designated in the contract documents in the various listed work items of the Bid Form.
2. The bids for the work are intended to establish a total cost for the work in its entirety. Should the Contractor feel that the cost for the work has not been established by specific items in the Bid Form, include the cost for that work in some related bid item so that the Proposal for the project reflects the total cost for completing the work in its entirety.
3. Contractor's Jobsite Record Drawings: Record drawings will not be paid as a separate bid item. See Section 013300 for general requirements regarding Contractor's Jobsite Record Drawings. See Section 330525 for detailed requirements regarding content and submittal of Contractor's HDD As-built Drawings.

C. Base Bid Item Descriptions

Base bid items are not intended to be exclusive descriptions of work categories and the Contractor shall determine and include in its pricing all materials, labor, and equipment necessary to complete each Bid Item.

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1. Bid Item No. 1 - Mobilization:

Payment for project mobilization shall be on a lump sum basis, and shall be made at the time of the first progress payment after the Contractor has purchased bonds, insurance, and established a Contractor's work site office.

2. Bid Item No. 2 - Traffic Control at Blosser Road During HDPE Laydown and Pipe Buildup:

Payment for Bid Item No. 2 shall be on a lump sum basis and shall include: Traffic regulation/control throughout the project duration and as required along Blosser Road and affected intersections during HDPE pipe laydown, heat fusion of joints, and pipe pull through in accordance with Specification Section 015526.

3. Bid Item No. 3 - Sheeting, Shoring and Bracing for the protection of life and limb:

Payment for Bid Item No. 3 shall be on a lump sum basis and shall include full compensation for furnishing the labor, materials, tools, equipment, and doing all the work involved for providing sheeting, shoring, bracing, and required excavation safety measures throughout the project at all required excavations. Excavations, sheeting, shoring, and bracing shall comply with local/State/Federal safety requirements.

4. Bid Item No. 4 – 24-Inch Pressure Class 250 Ductile Iron Pipe:

Payment for Bid Item No. 4 shall be by the linear foot of 24-inch Ductile Iron pipe installed. Measurement of ductile iron pipe shall be per linear foot (including fittings and other pipe sections), measured horizontally along the centerline as shown in the drawings. The unit costs shall include full compensation for pipe and fittings, couplings, harnesses, wax-tape coating, polyethylene sheet encasement, all other specified linings and coatings, trench excavation, pipe bedding, thrust blocks, pipe and trench backfill, erosion control, and furnishing all labor, materials, tools, and equipment associated with the installation of the 24-inch DI pipeline.

5. Bid Item No. 5 - 30-inch O.D. DR-9 HDPE (22.933-inch Average I.D.) Fusion-welded Pipeline Including HDD Bore:

Payment for Bid Item No. 5 shall be on a lump sum basis and shall include full compensation for furnishing the labor, materials, tools, equipment, and doing all the work involved for installation of the 30-inch O.D. DR-9 HDPE pipe in a horizontally directionally drilled borehole. The unit costs shall include equipment set up, pilot hole drilling, tracking and guidance of the pilot during drilling, reaming, surveying, disposal of materials and spoils, recycling and disposal of driller's mud, HDPE pipe and pipe joint fusion, HDPE couplings and adapters at transitions to other pipe materials, insertion of the HDPE carrier pipe into the surface casings and bore, annulus

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grouting, and pressure testing. If pilot hole is not within design tolerances, Contractor shall pay for: (1) re-engineering to meet design requirements or (2) abandonment and re-installation, at the Owner's direction and at no additional cost to the Owner.

6. Bid Item No. 6 – 48-inch Minimum Diameter Steel Surface Casing at HDD Entry Point:

Payment for Bid Item No. 6 shall be by the linear foot of 48-inch steel surface casing installed by the pipe ramming method at the HDD Entry Point as shown on the drawings. Measurement of steel surface casing shall be per linear foot, measured horizontally along the centerline as shown in the drawings. The unit costs shall include full compensation for pit excavation, steel casing pipe, welding, annulus grouting, installation to the design tolerances specified, disposal of materials and excavation spoils, and furnishing all labor, materials, tools, and equipment associated with the installation of the 48-inch steel surface casing. If casing is not within design tolerances, Contractor shall pay for either any re-engineering to meet design requirement or abandonment and re-installation at no additional cost to the Owner.

7. Bid Item No. 7 - 48-inch Minimum Diameter Steel Surface Casing at HDD Exit Point:

Payment for Bid Item No. 7 shall be by the linear foot of 48-inch steel surface casing installed by the pipe ramming method at the HDD Exit Point as shown on the drawings. Measurement of steel surface casing shall be per linear foot, measured horizontally along the centerline as shown in the drawings. The unit costs shall include full compensation for pit excavation, steel casing pipe, welding, annulus grouting, installation to the design tolerances specified, disposal of materials and excavation spoils, and furnishing all labor, materials, tools, and equipment associated with the installation of the 48-inch steel surface casing. If casing is not within design tolerances, Contractor shall pay for either any re-engineering to meet design requirement or abandonment and re-installation at no additional cost to the Owner.

8. Bid Item No. 8 – Site Restoration:

Payment for Bid Item No. 8 shall be on a lump sum basis and shall include full compensation for furnishing the labor, materials, tools, equipment, and doing all the work involved for grading, excavation, surveying, disposal of materials and spoils required to return the site to preconstruction conditions. Contractor will be required to reimburse the District for any damage to private property or for damage caused in the completion of work. Contractor will be required to reimburse the District for any fines for environmental damage.

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9. Bid Item No. 9 – Pressure Tests and Disinfection:

Payment for Bid Item No. 9 shall be on a lump sum basis and shall include full compensation for furnishing the labor, materials, tools, equipment, and doing all the work involved for pressure testing of pipelines and disinfection in accordance with the Contract Documents.

10. Bid Item No. 10 – Environmental Mitigation Measures:

Bid Item No. 10 is a lump sum bid item and shall include full compensation for furnishing all labor, materials, tools, equipment, and conducting all work required for complying with the District's adopted environmental mitigation measures, monitoring, and all environmental permit requirements as included in the Contract Documents.

11. Bid Item No. 11 – Provide Necessary Permits, Temporary Fencing Around Laydown and Work Areas, and Other Incidentals:

Payment for Bid Item No. 11 shall be on a lump sum basis and shall include full compensation for furnishing the labor, materials, tools, equipment, and doing all the work involved in obtaining and paying for necessary permits, excavation dewatering (if required), and temporary fencing around construction laydown and work areas.

D. Additive Bid Items

The following bid item(s) shall not be included in the base bid, but may be required as part of this work effort. The Contractor must notify and obtain written authorization from the District's Representative before conducting the activities listed below.

12. Bid Item No. 12 – Disposal of "Naturally Occuring" Petroleum Contaminated Drilling Mud and Bore Hole Cuttings, If Encoutered:

Payment for Bid Item No. 12 shall be on a unit cost basis per Cubic Yard (CY) of material disposed. The unit cost shall include full compensation for furnishing the labor, materials, tools, equipment, and doing all the work involved to provide legal disposal of "naturally occurring" Petroleum Contaminated Drilling Mud and Bore Hole Cuttings (if encountered during drilling operations) including containment, certification of drilling mud and spoils that are determined to be impacted, transporting, disposal fees and permit fees. The Contractor shall diligently segregate such material and avoid disbursing contamination to non-contaminated material.

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SECTION 013300 SUBMITTALS

A. Shop Drawings

1. Submit shop drawings in accordance with the General Conditions and as required by the individual sections of the Specifications.
2. The use of contract drawing reproductions for shop drawings is subject to rejection.
3. The Contractor shall review, mark with his approval, and submit for review by the Owner's Representative shop drawings as called for in the General Conditions, Specifications, Nipomo Community Services District Standard Specifications, and/or requested by the Owner's Representative. Drawings shall be submitted to the Owner's Representative and be accompanied by a letter of transmittal listing the drawings submitted. Drawings shall show the name of the project, the name of the Contractor, and if any, the names of suppliers, manufacturers, and subcontractors. Shop drawings shall be submitted with promptness and in orderly sequence so as to cause no delay in prosecution of the work.

Shop drawings shall be complete in all respects. If the shop drawings show any deviations from the requirements of the plans and specifications because of standard shop practices or other reasons, the deviations and the reasons therefore shall be set forth in the letter of transmittal.

By submitting shop drawings, the Contractor represents that material, equipment, and other work shown thereon conforms to the plans and specifications, except for any deviations set forth in the letter of transmittal.

Within 30 calendar days after receipt of said drawings, the Owner's Representative will return two of the copies of the drawings to the Contractor with any comments noted on the submittal response letter. If so noted by the Owner's Representative, the Contractor shall correct the drawings and resubmit them in the same manner as specified for the original submittal. The Contractor in the letter of transmittal accompanying resubmitted shop drawings shall direct specific attention to revisions other than the corrections requested by the Owner's Representative on previous submittals.

The review by the Owner's Representative is only of general conformance with the design concept of the project and general compliance with the plans and specifications and shall not be construed as relieving the Contractor of the full responsibility for: providing materials, equipment, and work required by the contract; the proper fitting and construction of the work; the accuracy and completeness of the shop drawings; selecting fabrication processes and techniques of construction; and performing the work in a safe manner.

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No portion of the work requiring a shop drawing submittal shall be commenced until the submittal has been reviewed by the Owner's Representative and returned to the Contractor with a notation indicating that resubmittal is not required.

4. If the Contractor submits shop drawings of equipment by manufacturers other than those listed in the specifications, provide the following information with the submittal:
 - a. The name and address of at least three companies or agencies that are currently using the equipment.
 - b. The name and telephone number of at least one person at each of the above companies or agencies whom the Owner's Representative may contact.
 - c. A description of the equipment that was installed at the above locations. The description shall be in sufficient detail to allow the Owner's Representative to compare it with the equipment that is proposed to be installed in this project.
5. For materials originating outside of the United States for which tests are required, provide recertification and retesting by an independent domestic testing laboratory.

B. Submittal Requirements

1. Make submittals promptly in such sequence as to cause no delay in the work. Schedule submission a minimum of 30 calendar days before dates reviewed submittals will be needed.
2. Submit five (5) copies of shop drawings. The Owner's Representative will keep three copies and return one copy. If the Contractor desires more than one copy, he shall transfer the Owner's Representative's comments onto additional copies at his own expense. Clearly indicate the specification section, and drawing number to which each shop drawing is referenced.
3. Submittals shall contain:
 - a. The date of submission and the dates of any previous submissions.
 - b. The project title and number.
 - c. Contract identification.
 - d. The names of:
 - (1) Contractor.

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- (2) Supplier.
- (3) Manufacturer.
- e. Identification of the product, with the specification section number.
- f. Field dimensions, clearly identified as such.
- g. Relation to adjacent or critical features of the work or materials.
- h. Identification of deviations from contract documents.
- i. Identification of revisions on resubmittals.
- j. Contractor's stamp, initialed or signed, shall certify Contractor's review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal that the product meets the requirements of the work and of the contract documents.

C. Submittal Format

1. Each submittal shall have a transmittal form. Every page in a submittal shall be numbered in sequence. Each copy of a submittal shall be collated and stapled or bound, as appropriate. Copies not collated will be rejected.
2. Where product data from a manufacturer is submitted, clearly mark which model is proposed, with all pertinent data, capacities, dimensions, clearances, diagrams, controls, connections, anchorage, and supports. Present a sufficient level of detail for assessment of compliance with the contract documents.
3. Each submittal shall be assigned a unique number. Submittals shall be numbered sequentially. The submittal numbers shall be clearly noted on the transmittal. Original submittals shall be assigned a numeric submittal number. Resubmittals shall bear an alphanumeric system which consists of the specification section number assigned to the original submittal for that item followed by a letter of the alphabet to represent that it is a subsequent submittal of the original. For example, if Submittal 030500-02 requires a resubmittal, the first resubmittal will bear the designation "030500-01A" and the second resubmittal will bear the designation "030500-01B" and so on.
4. Disorganized submittals that do not meet the requirements above will be returned without review.

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D. Resubmittals

Resubmittal of submittals will be reviewed and returned in the same review period as for the original submittal. It is considered reasonable that the Contractor shall make a complete and acceptable submittal by the second submission of a submittal item. The District reserves the right to withhold monies due to the Contractor to cover additional costs of any review beyond the second submittal.

E. Contractor's Jobsite Record Drawings

Provide and maintain on the jobsite one complete set of prints of all drawings which form a part of the contract. Immediately after each portion of the work is installed, indicate all deviations from the original design shown in the drawings either by additional sketches or ink thereon.

The Contractor is required to keep this record set up to date and shall bring it to each Progress Meeting with the Owner's Representative for review by the Owner's Representative and/or the District Engineer.

Upon completion of the job, deliver this record set to the District.

F. Worker Protection and Waste Product Containment Plans

Within seven days of contract award, the Contractor shall submit a worker protection plan and waste product containment plan to the Owner's Representative. The Notice to Proceed will not be issued until these plans have been accepted.

G. Excavation and Shoring Drawings

Submit excavation and shoring drawings for worker protection in conformance with Specification Section 007300 and 312316.

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SECTION 015100 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

A. Construction Water

1. Related Work Specified Elsewhere:
 - a. Mitigation Monitoring Compliance and Reporting: 011160
 - b. Trenching, Backfilling, and Compacting: 312316.
 - c. General Concrete Construction: 030500.
 - d. Pressure Testing of Piping: 400515.
2. The Contractor shall make his own arrangements for developing water sources and supply labor and equipment to collect, load, transport, and apply water as necessary for compaction of materials, concrete construction operations, testing, pipeline disinfection, dust control, and other construction use.
3. Develop sources of water supply or obtain water from private sources. Payment for costs connected with utilization of the source shall be made by the Contractor. Water shall be clean and free from objectionable deleterious amounts of acids, alkalies, salts, or organic materials.
4. Include the cost of construction water in the appropriate bid item to which it is appurtenant. The cost shall include full compensation for furnishing all labor, materials, tools, and equipment and doing all the work necessary to develop a sufficient water supply and furnishing the necessary equipment for applying the water as described in these specifications.

B. Electrical Power--Construction Phase

Provide for the purchase of power or provide portable power for the construction of the project where existing outlets are not available. Provide for the extension of utility lines to the point of usage. The cost of power shall be included in the appropriate bid items to which it is appurtenant and shall include full compensation for furnishing all labor, materials, tools, and equipment required to obtain and distribute power for construction purposes.

C. Dust Control

Perform dust control operations in accordance with Section 011160 (Mitigation Monitoring Compliance and Reporting) to prevent construction operations from producing dust in amounts harmful to persons or causing a nuisance to persons living nearby or occupying buildings in the vicinity of the work.

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D. Fire Danger

Minimize fire danger in the vicinity of and adjacent to the construction site. Provide labor and equipment to protect the surrounding private property from fire damage resulting from construction operations.

E. Traffic Regulation

See Specification Section 015526.

F. Construction Survey Staking

The Owner will provide construction survey staking in conformance with General Conditions Section XXXXXX, except as modified in Section 007300.

G. Access Roads and Parking Areas

1. Obtain access to project site through the existing gate on [REDACTED]. Keep the existing gate accessible at all times so that the Owner's vehicles have access to the site.
2. The Contractor and his employees will not be permitted to park their vehicles within the project site. Provide facilities offsite or on public streets on which parking is permitted by local and state codes and ordinances.

H. Temporary Site for Material Laydown and Staging Area

In addition to the temporary construction easements obtained for the construction of the PROJECT, The Contractor shall coordinate additional required temporary laydown and staging areas and shall submit proposed site selections to the OWNER or other governing agency with jurisdiction. Approval from the governing agency is required prior to mobilization.

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SECTION 017410 CLEANING DURING CONSTRUCTION AND FINAL CLEANING

A. General

1. This section includes cleaning during construction and final cleaning on completion of the work.
2. At all times maintain areas covered by the contract and adjacent properties and public access roads free from accumulations of waste, debris, and rubbish caused by construction operations.
3. Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws. Do not burn or bury rubbish or waste materials on project site. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains. Do not dispose of wastes into streams or waterways.
4. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
5. Provide approved sanitary facilities for all Contractor personnel, as no existing facilities will be available to the Contractor. Facilities shall be maintained during the project to complete standards established by the Owner's Representative, and shall be removed prior to Contractor's departure from the site at the completion of the project.

B. Related Work Specified Elsewhere

1. Mitigation Monitoring Compliance and Reporting: 011160
2. Clearing, Stripping, and Grubbing: 311100

C. Measurement and Payment

See Specification Section 012000 – Measurement and Payment.

D. Cleaning During Construction

1. During execution of work, clean site, adjacent properties, and public access roads and dispose of waste materials, debris, and rubbish to assure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.
2. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
3. Provide containers for collection and disposal of waste materials, debris, and rubbish.

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4. Cover or wet excavated material leaving and arriving at the site to prevent blowing dust. Clean the public access roads to the site of any material falling from the haul trucks.

E. Final Cleaning

1. At the completion of work and immediately prior to final inspection, clean the entire project site as follows.
2. Clean, sweep, wash, and polish all work and equipment including finishes.
3. Remove grease, dust, dirt, stains, and foreign materials from finished surfaces.
4. Repair, patch, and touch up marred surfaces to match adjacent surfaces.
5. Remove from the site temporary structures and materials, equipment, and appurtenances not required as a part of, or appurtenant to, the completed work.

END OF SECTION

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SECTION 020120 PROTECTING EXISTING UNDERGROUND UTILITIES

PART 1 - GENERAL

A. Description

This section includes materials and procedures for protecting existing underground utilities.

B. Related Work Specified Elsewhere

1. Supplement to General Conditions: 007300
2. Trenching, Backfilling, and Compacting: 312316.

C. Measurement and Payment

See Specification Section 012000 – Measurement and Payment.

PART 2 - MATERIALS

A. Replacement in Kind

Except as specifically authorized by the Owner's Representative, reconstruct utilities with new material of the same size, type, and quality as that removed.

PART 3 - EXECUTION

A. General

1. Subsurface utility data are depicted to Level D as defined in "Standard Guideline for Collection and Depiction of Existing Subsurface Utility Data, CI/ASCE 38-02".
2. Replace in kind street improvements, such as curbs and gutters, barricades, traffic islands, signalization, fences, signs, etc., that are cut, removed, damaged, or otherwise disturbed by the construction to the satisfaction of the Owner.
3. Where utilities are parallel to or cross the construction but do not conflict with the permanent work to be constructed, follow the procedures given below. Notify the utility owner at least 48 hours in advance of the crossing construction and coordinate the construction schedule with the utility owner's requirements. For utility crossings not shown in the drawings, refer to the

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General Conditions and the instructions of the Owner's Representative for guidance.

4. Determine the true location and depth of utilities and service connections which may be affected by or affect the work. Determine the type, material, and condition of these utilities. In order to provide sufficient lead-time to resolve unforeseen conflicts, order materials and take appropriate measures to ensure that there is no delay in work.
5. Expose utilities a minimum of 500 feet in advance of the pipeline construction.

B. Procedures

1. **Protect in Place:** Protect utilities in place, unless abandoned, and maintain the utility in service, unless otherwise specified in the drawings or in the specifications.
2. **Abandoned in Place:** Where so indicated in the drawings or as determined by the Owner's Representative, cut abandoned utility lines and plug the ends per the drawings.
3. **Remove and Reconstruct:** Where so indicated in the drawings or as required by the Owner's Representative, remove the utility and, after passage, reconstruct it with new materials. Provide temporary service for the disconnected utility to the satisfaction of the Owner.

C. Compaction

1. **Utilities Protected in Place:** Backfill and compact under and around the utility so that no voids are left.
2. **Utilities Reconstructed:** Prior to replacement of the utility, backfill the trench and compact to an elevation 1 foot above the top of the ends of the utility. Excavate a cross trench of the proper width for the utility and lay, backfill, and compact.
3. **Alternative Construction--Sand-Cement Slurry:** With approval of the Owner's Representative, Sand-cement slurry may be substituted for other backfill materials to aid in reducing compaction difficulties. Sand-cement slurry shall consist of one sack (94 pounds) of portland cement per cubic yard of sand and sufficient moisture for workability. The Contractor is responsible for the protection of the utility during construction.

D. Adjacent Utilities

The Contractor's attention is called to the following utilities located within the work boundaries:

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Utility	Location
Irrigation Pipe	APN: 090-341-019 (Agricultural field under cultivation, north of Santa Maria levee)
Irrigation Pipe	APN: 090-291-039 (Agricultural field under cultivation, Nipomo Mesa)
Overhead Electrical	APN: 090-291-039 Crossings at: STA 22+10 and STA 23+30

Protect these utilities, including appurtenances and existing thrust blocks, from any disturbances and repair the utilities and associated appurtenances if they are damaged in any way. All costs incurred for protection, repair, replacement, and resulting disruption of these utilities or any costs incurred due to their presence, whether or not they lie within the new construction, shall be borne in full by the Contractor. See drawings for approximate locations of known utilities. Note, service laterals and connections are not all shown on the drawings.

END OF SECTION

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SECTION 030500 GENERAL CONCRETE CONSTRUCTION

PART 1 - GENERAL

A. Description

This section includes materials, installation, and testing of formwork, reinforcing steel, joints, concrete, and finishing and curing for general concrete construction.

B. Related Work Specified Elsewhere in Specifications

1. Trenching, Backfilling, and Compacting: 312316
2. Ductile Iron Pipe and Fittings: 402040
3. HDPE Pipe: 402097

C. Submittals

1. Submit shop drawings in accordance with Specification Section 013300.
2. Prepare concrete and mortar mix designs and laboratory 7-day and 28-day compressive tests, or submit test reports of 7- and 28-day compressive tests of the mix where the same mix has been used on two previous projects. Prepare mix designs in accordance with ACI 318, Chapters 4 and 5, except as modified herein. Submit mix design in writing for review by the District's Representative at least 15 days before placing of any concrete.
3. Submit manufacturer's catalog data and descriptive literature for form ties, spreaders, corner formers, form coatings and curing compound.
4. Submit six copies of a report from a testing laboratory verifying that aggregate material contains less than 1% asbestos by weight or volume and conforms to the specified gradations or characteristics.

D. Measurement and Payment

See Specification Section 012000 – Measurement and Payment.

PART 2 - MATERIALS

A. Nondomestic Cement and Additives

1. The use of nondomestic cement and additives in concrete may be permitted only after review of a written request to use such materials. The request to use nondomestic materials shall include a chemical analysis that indicates

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the material meets the project specifications. Certifications that state the nondomestic materials meet the project requirements will not be accepted.

2. Test reports for concrete materials shall be current to within three months of inclusion into the project and shall be identifiable to the materials supplied.

B. Formwork

1. Design forms according to ACI 347.
2. Class II Forms: Use plywood in good condition, metal, or smooth-planed boards free from large or loose knots with tongue and groove or ship lap joints.
3. Class II forms may be used for exterior concrete surfaces that are 1 foot or more below finished grade.
4. Coat forms with form release agent.

C. Form Release Agent

1. Form release agent shall effectively prevent absorption of moisture and prevent bond with the concrete. Agent shall be nonstaining and nontoxic after 30 days.

D. Reinforcing Steel

1. Reinforcement shall conform to ASTM A615, Grade 60.
2. Fabricate reinforcing in accordance with the current edition of the Manual of Standard Practice, published by the Concrete Reinforcing Steel Institute. Bend reinforcing steel cold.
3. Deliver reinforcing steel to the site bundled and with identifying tags.

E. Tie Wire

Tie wire shall be 16 gauge minimum, black, soft annealed.

F. Cement

1. Use domestic portland cement that conforms to ASTM C150 Type II.
2. Use only one brand of cement in any individual structure. Use no cement that has become damaged, partially set, lumpy, or caked. Reject the entire contents of the sack or container that contains such cement. Use no salvaged or reclaimed cement.

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3. Maximum tricalcium aluminate shall not exceed 8%. The maximum percent alkalis shall not exceed 0.6%.

G. Aggregates

Aggregates shall be natural rock, sand, or crushed natural rock and shall comply with ASTM C33, and shall contain less than 1% asbestos by weight or volume. Aggregates shall be free from any substances that will react with the cement alkalis, as determined by Appendix X-1 of ASTM C33.

H. Water and Ice

Use water and ice that is clean and free from objectionable quantities of organic matter, alkali, salts, and other impurities that might reduce the strength, durability, or otherwise adversely affect the quality of the concrete. Water shall not contain more than 500 mg/L of chlorides or more than 500 mg/L of sulfate.

I. Concrete Admixtures

1. Class A concrete shall contain an air-entraining admixture conforming to ASTM C260. Admixtures shall be Master Builders MB-AE 90, Sika AER, or equal.
2. Class A concrete shall contain a water-reducing admixture conforming to ASTM C494, Type A. It shall be compatible with the air-entraining admixtures. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations. Admixture shall be Master Builders Pozzolith polymer-type normal setting, Plastocrete 161 or Plastiment, Sika Chemical Corporation, or equal.
3. Pozzolan Admixture: Where specified, provide concrete containing pozzolan admixture conforming to ASTM C618 Type F Max 15% by weight.
4. Do not use any admixture that contains chlorides or other corrosive elements in any concrete. Admixtures shall be nontoxic after 30 days.

J. Concrete Mix Design

1. Conform to ASTM C94, except as modified by these specifications.
2. Air content as determined by ASTM C231 shall be 4% \pm 1%.
3. Maximum water-cement ratio for Class A concrete = 0.45 by weight.
4. Use classes of concrete as described in the following table:

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Class	Type of Work	28-Day Compressive Strength (in psi)	Minimum Cement Content (in lbs per C.Y.)
A	Concrete fill at supports across pipe trenches. Concrete not otherwise specified.	4,000	564
B	Thrust blocks and anchors	3,000	500

5. Measure slump in accordance with ASTM C143. Slump shall be 4 inches maximum.

Proportion and produce the concrete to have a maximum slump as shown. A tolerance of up to 1 inch above the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit. Concrete of lower than usual slump may be used provided it is properly placed and consolidated.

6. Aggregate size shall be 1 inch maximum for sections greater than 8 inches.
7. Combined aggregate grading shall be as shown in the following table:

Sieve Sizes	Maximum Aggregate Size
	1"
	Percent Passing
2"	---
1-1/2"	100
1"	90 - 100
3/4"	55 - 100
3/8"	45 - 75
No. 4	35 - 60
No. 8	27 - 45
No. 16	20 - 35
No. 30	12 - 25
No. 50	5 - 15
No. 100	1 - 5
No. 200	0 - 2

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8. Mix design for pumped concrete shall produce a plastic and workable mix. The percentage of sand in the mix shall be based on the void content of the coarse aggregate.
- K. Slurry Cement Backfill
See Specification Section 312316.
- L. Curing Compound
 1. Curing compound shall conform to ASTM C309 Type I Class A.
 2. Curing compound shall be compatible with required finishes and coatings and shall meet the State of California Clean Air Quality Standards which limit the quantity of volatile organic compounds to 100 g/L.

PART 3 - EXECUTION

- A. Form Surface Preparation
 1. Clean form surfaces to be in contact with concrete of foreign material prior to installation.
 2. Coat form surfaces in contact with concrete with a release agent prior to form installation.
- B. Placing Reinforcement
 1. Place reinforcing steel in accordance with the current edition of Recommended Practice for Placing Reinforcing Bars, published by the Concrete Reinforcing Steel Institute.
 2. Place reinforcing in accordance with the following, unless otherwise indicated:
 - a. Reinforcement indicated in the drawings is continuous through the structure to the farthest extent possible. Terminate bars and hooks 2 inches clear from faces of concrete.
 3. Reinforcing steel, before being positioned and just prior to placing concrete, shall be free from loose mill and rust scale and from any coatings that may destroy or reduce the bond. Clean reinforcing steel by sandblasting or wire brushing and remove mortar, oil, or dirt to remove materials that may reduce the bond.
 4. Do not straighten or rebend reinforcing steel in the field.
 5. Position reinforcing steel in accordance with the drawings and secure by using annealed wire ties or clips at intersections and support by concrete or

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metal supports, spacers, or metal hangers. Do not place metal clips or supports in contact with the forms. Bend tie wires away from the forms to provide the specified concrete coverage. Bars, in addition to those shown in the drawings, which may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at his own expense.

6. Place reinforcement a minimum of 2 inches clear of any metal pipe or fittings.
7. Secure reinforcing dowels in place prior to placing concrete. Do not press dowels into the concrete after the concrete has been placed.

C. Site-Mixed Concrete

Conform to ACI 304.

D. Ready-Mixed Concrete

Conform to ASTM C94.

E. Placing Concrete

Conform to ACI 304.

F. Pumping Concrete

Conform to ACI 304.2R-91.

G. Weather Requirements

1. Conform to ACI 305 for placing during hot weather.
2. Conform to ACI 306 for placing during cold weather.

H. Curing Concrete

1. Conform to ACI 308.
2. It is the responsibility of the Contractor to select the appropriate curing method in response to climatical and/or site conditions occurring at the time of concrete placement. Take appropriate measures as described in ACI 305 and 306 for protecting and curing concrete during hot and cold weather.

I. Repair of Defects and Cracks

1. Do not repair defects until concrete has been evaluated by the District's Representative.

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2. Surface Defects:
 - a. Repair surface defects that are smaller than 1 foot across in any direction and are less than 1/2 inch in depth.
 - b. Repair by removing the honeycombed and other defective concrete down to sound concrete, cut or grind edges perpendicular to the surface and at least 3/8 inch deep, abrasive clean and thoroughly dampen the surface, work into the surface an epoxy bonding agent, and fill the hole with one part cement to one part fine sand. Match the finish on the adjacent concrete, and cure as specified.
3. Severe Defects:
 - a. Repair severe defects that are larger than surface defects but do not appear to affect the structural integrity of the structure.
 - b. Repair by removing the honeycombed and other defective concrete down to sound concrete, make edges of the repair area perpendicular to the surface, as required above, sandblast the sound concrete surface, coat the exposed surfaces with epoxy bonding compound, place nonshrink grout, match the finish on the adjacent concrete, and cure as specified.
4. Repair minor cracks in concrete structures that are wider than 1/10 inch by cutting out a square edged and uniformly aligned joint 3/8 inch wide by 3/4 inch deep, preparing exposed surfaces of the joint, priming the joint, and applying polyurethane joint sealant.
5. If the cracks are major or affect the hydraulic capacity or function of the element, the District's Representative may require the concrete to be repaired by epoxy injection.
6. Major Defects and Cracks: If the defects affect the structural integrity of the structure or if patching does not satisfactorily restore quality and appearance to the surface, the District's Representative may require the concrete to be removed and replaced, complete.

J. Concrete Tests

1. Concrete quality testing will be performed on the concrete by the District's Representative as follows:
 - a. Frequency of Sampling: Cast four concrete test cylinders from each 50 cubic yards, or fraction thereof, of each class of concrete placed in any one day. Sampling and curing of cylinders shall conform to ASTM C31.

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- b. Strength Testing: Test cylinders in accordance with ASTM C39. Test one cylinder at 7 days for information; test two cylinders at 28 days for acceptance; and hold one cylinder for verification. Strength acceptance will be based on the average of the strengths of the two cylinders tested at 28 days. If one cylinder of a 28-day test manifests evidence of improper sampling, molding, or testing, other than low strength, discard it and use the fourth cylinder for the test result.
 - c. Determine concrete slump by ASTM C143 with each strength test sampling and as required to establish consistency.
 - d. The average value of concrete strength tests shall be equal to or greater than the specified 28-day strength. No test shall be less than 90% of the specified 28-day strength.
 - e. If the 28-day strength tests fail to meet the specified minimum compressive strength, the concrete will be assumed to be defective and one set of three cores from each area may be taken as selected by the District and in accordance with ASTM C42. If the average compressive strength of the set of three concrete cores fails to equal 90% of the specified minimum compressive strength or if any single core is less than 75% of the minimum compressive strength, the concrete will be considered defective. The District may require additional coring, nondestructive load testing, or repair of defective concrete. Costs of coring, testing of cores, load testing, and required repairing pertaining thereto shall be paid by the Contractor at no extra cost to the District.
2. To facilitate concrete sampling and testing, the Contractor shall:
- a. Furnish labor to assist the District's Representative in obtaining and handling samples at the project site.
 - b. Advise the District's Representative in advance of concrete placing operations to allow for scheduling and completion of quality testing.
 - c. Provide and maintain facilities for safe storage and proper curing of concrete test specimens on the project site, as required by ASTM C31.

END OF SECTION

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SECTION 099752 COLD-APPLIED WAX TAPE COATING

PART 1 - GENERAL

A. Description

This section includes materials and application of a three-part, cold-applied wax tape coating system for buried piping per NACE RP0375-2006, Section 4 except as modified herein.

B. Related Work Specified Elsewhere in Specifications

Polyethylene Sheet Encasement: 099754.

C. Submittals

1. Submit shop drawings in accordance with Specification Section 013300.
2. Submit manufacturer's catalog data sheets and application instructions.
3. Submit copies of delivery slips for all materials specified in this section.

D. Measurement and Payment

See Specification Section 012000 – Measurement and Payment.

PART 2 - MATERIALS

A. Primer

1. Primer shall be a blend of petrolatums, plasticizers, and corrosion inhibitors having a paste-like consistency. The primer shall have the following properties:
 - a. Pour Point: 100°F to 110°F.
 - b. Flash Point: 350°F.
 - c. Coverage: 1-gallon per 100 square feet.
2. Primer shall be Trenton Wax Tape Primer, Denso Paste Primer, or equal.

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B. Wax Tape

1. Wax tape shall consist of a synthetic-fiber felt, saturated with a blend of microcrystalline wax, petrolatums, plasticizers, and corrosion inhibitors, forming a tape coating that is easily formable over irregular surfaces. The tape shall have the following properties:
 - a. Saturant Pour Point: 115°F to 120°F.
 - b. Thickness: 50 to 70 mils.
 - c. Tape Width: 6 inches.
 - d. Dielectric Strength: 100 volts/mil.
2. Wax tape shall be Trenton No. 1 Wax Tape, Denso "Densyl Tape," or equal.

C. Plastic Wrapper

1. Wrapper shall be a polyvinylidene chloride plastic with three 50-gauge plies wound together as a single sheet. The wrapper shall have the following properties:
 - a. Color: Clear.
 - b. Thickness: 1.5 mils.
 - c. Tape Width: 6 inches.
2. Plastic wrapper shall be Trenton Poly-Ply, Denso Tape PVC Self-Adhesive, or equal.

D. Polyethylene Sheet Encasement

See Section 099754.

PART 3 - EXECUTION

A. Wax Tape Coating Application

1. Surfaces shall be clean and free of all dirt, grease, water, and other foreign material prior to the application of the primer and wax tape.
2. Apply primer by hand or brush to all surfaces of the fitting. Work the primer into all crevices and completely cover all exposed metal surfaces.

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3. Apply the wax tape immediately after the primer application. Work the tape into the crevices around fittings. Apply the wax tape by pressing and molding the tape into conformity with the surface so that it does not bridge over irregular surface configurations. Begin wrapping approximately 3 inches behind the area to be wrapped. If starting at a straight edge, wrap the tape spirally around the pipe while touching the end edge before starting the angle to begin the spiral. If the previous roll is headed in a downward direction, tuck the next roll under the previous roll. Stretch each roll tight as wrapping continues to avoid air bubbles.
4. Wrap the wax tape spirally around the pipe and across the fitting. Use a minimum overlap of 50% of the tape width. Apply tape to flanges, mechanical and restrained joint bolts, nuts and glands, and grooved-end couplings to 6 inches beyond each side of the item.
5. Work the tape into the crevices and contours of irregularly shaped surfaces and smooth out so that there is a continuous protective layer with no voids or spaces under the tape.
6. After application, seal the overlap seams of the tape by hand by tapering and pressing the seam, attempting to create a continuous surface. There shall be no air pockets underneath the tape. The tape shall have direct intimate contact with the pipe surface.
7. On vertical sections of the piping, such as at pipe-to-soil transitions, wrap the pipe starting from the bottom and proceeding upward so that downward flowing water and backfill do not catch in a seam.
8. Overwrap the completed wax tape installation with the plastic wrapping material. Wrap spirally around the pipe and across the fitting. Use a minimum overlap of 55% of the tape width and apply two layers or applications of overwrap. Secure plastic wrapper to pipe with adhesive tape.

B. Application of Polyethylene Sheet Coating to Buried Piping, Fittings, Couplings, and Valves

Wrap completed wax tape coating system with polyethylene sheet per Specification Section 099754 and secure around the adjacent pipe circumference with adhesive tape.

END OF SECTION

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SECTION 099754 POLYETHYLENE SHEET ENCASUREMENT

PART 1 - GENERAL

A. Description

This section includes materials and installation of a polyethylene sheet encasement for steel and buried ductile iron pipe, fittings, and valves.

B. Related Work Specified Elsewhere in Specifications

1. Cold-Applied Wax Tape Coating: 099752.
2. Trenching, Backfilling, and Compacting: 312316.
3. Ductile-Iron Pipe and Fittings: 402040.

C. Submittals

1. Submit shop drawings in accordance with Specification Section 013300.
2. Submit manufacturer's catalog literature and product data sheets describing the physical, chemical, and electrical properties of the encasement material.
3. Submit copies of delivery slips for all materials specified in this section.

D. Measurement and Payment

See Specification Section 012000 – Measurement and Payment.

PART 2 - MATERIALS

A. Polyethylene Wrap

1. The encasement shall consist of low-density polyethylene wrap of at least 8 mils thickness conforming to AWWA C105. Color: Blue or Black.
2. Polyethylene encasement for ductile iron pipe shall be supplied as a flat tube meeting the dimensions of Table 1 in AWWA C105 and shall be supplied by the ductile iron pipe manufacturer.

B. Plastic Adhesive Tape

1. Tape shall consist of polyolefin backing and adhesive which bonds to common pipeline coatings including polyethylene.

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2. Minimum Width: 2 inches.
3. Products: Canusa Wrapid Tape, Tapecoat 35, Polyken 934, or equal.

PART 3 - EXECUTION

A. Applying Sheet Coating to Buried Piping and Fittings

1. Apply wrapping per AWWA C105 as modified herein.
2. Apply a single wrapping.
3. Install the polyethylene to completely encase the pipe and fittings to provide a watertight corrosion barrier. Continuously secure overlaps and ends of sheet and tube with polyethylene tape. Make circumferential seams with two complete wraps, with no exposed edges. Tape longitudinal seams and longitudinal overlaps, extending tape beyond and beneath circumferential seams.
4. Wrap bell-spigot interfaces, restrained joint components, and other irregular surfaces with wax tape prior to placing polyethylene encasement.
5. Minimize voids beneath polyethylene. Place circumferential or spiral wraps of polyethylene tape at 2-foot intervals along the barrel of the pipe to minimize the space between the pipe and the polyethylene.
6. Overlap adjoining polyethylene tube coatings a minimum of 1 foot and wrap prior to placing concrete anchors, collars, supports, or thrust blocks. Hand wrap the polyethylene sheet, apply two complete wraps with no exposed edges to provide a watertight corrosion barrier, and secure in place with 2-inch-wide plastic adhesive tape.

B. Applying Sheet Coating to Buried Valves

1. Wrap flanges and other irregular surfaces with wax tape. Press tightly into place leaving no voids underneath and a smooth surface under coating for polyethylene sheet.
2. Wrap with a flat sheet of polyethylene. Place the sheet under the valve and the flanges or joints with the connecting pipe and fold in half. Extend the sheet to the valve stem and secure the sheet in place with 2-inch-wide plastic adhesive tape. Apply a second layer and secure with tape. Make two complete wraps, with no exposed edges, to provide a watertight corrosion barrier. Secure the sheets with tape around the valve stem below the operating nut and around the barrel of the connecting pipe to prevent the entrance of water and soil. Place concrete anchor and support blocks after the wrap has been installed.

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C. Applying Sheet Coating to Buried Flexible Pipe Couplings

1. Wrap irregular surfaces with wax tape. Press tightly into place leaving no voids underneath and a smooth surface under coating for polyethylene sheet.
2. Apply two layers or wraps around the coupling. Overlap the adjoining pipe or fitting a minimum of 1 foot and secure in place with tape. Provide sufficient slack in polyethylene to allow backfill to be placed around fitting without tearing polyethylene. Apply tape around the entire circumference of the overlapped section on the adjoining pipe or fitting in two complete wraps, with no exposed edges, to provide a watertight corrosion barrier.

D. Repair of Polyethylene Material

Repair polyethylene material that is damaged during installation. Use polyethylene sheet, place over damaged or torn area, and secure in place with 2-inch-wide plastic adhesive tape.

E. Backfill for Polyethylene-Wrapped Pipe, Valves, and Fittings

Backfill within 1 foot of the pipe, valves, and fittings wrapped with polyethylene encasement shall be sand per Specification Section 312316, unless indicated otherwise in the drawings.

END OF SECTION

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SECTION 099761 FUSION-BONDED EPOXY LININGS AND COATINGS

PART 1 - GENERAL

A. Description

This section includes materials, application, and testing of one-part, fusion-bonded, heat-cured, thermosetting, 100% solids epoxy linings and coatings for: steel, cast-iron, and ductile-iron equipment, such as valves and flexible pipe couplings.

B. Related Work Specified Elsewhere

1. Painting and Coating: 099000
2. Valves: 400520.

C. Submittals

1. Submit shop drawings in accordance with Section 013300.
2. Submit manufacturer's catalog literature and product data sheets, describing the physical and chemical properties of the epoxy coating. Describe application and curing procedure.
3. Submit coating application test records for measuring coating thickness and holiday detection for each item or pipe section and fitting. Describe repair procedures used.

D. Measurement and Payment

See Specification Section 012000 – Measurement and Payment.

PART 2 - MATERIALS

A. Equipment Surfaces

The Contractor shall require the equipment suppliers to provide equipment that is free of salts, oil, and grease to the coating applicator.

B. Shop-Applied Epoxy Lining and Coating

Lining and coating shall be a 100% solids, thermosetting, fusion-bonded, dry powder epoxy resin: Scotchkote 134 or 206N, Lilly Powder Coatings "Pipeclad 1500 Red," H. B. Fuller 1F-3003, or equal. Epoxy lining and coating shall meet or exceed the following requirements:

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Hardness (minimum)	Barcol 17 (ASTM D 2583) Rockwell 50 ("M" scale)
Abrasion resistance (maximum value)	1,000 cycles: 0.05 gram removed
	5,000 cycles: 0.115 gram removed
	ASTM D 1044, Tabor CS 17 wheel, 1,000-gram weight
Adhesion (minimum)	3,000 psi (Elcometer)
Tensile strength	7,300 psi (ASTM D 2370)
Penetration	0 mil (ASTM G 17)
Adhesion overlap shear, 1/8-inch steel panel, 0.010 glue line	4,300 psi, ASTM D 1002
Impact (minimum value)	100 inch-pounds (Gardner 5/8-inch diameter tup)

C. Field-Applied Epoxy Coating for Patching

Use a two-component, 80% solids liquid resin, such as Scotchkote 306.

PART 3 - EXECUTION

A. Shop Application of Fusion-Bonded Epoxy Lining and Coating--General

1. Grind surface irregularities, welds, and weld spatter smooth before applying the epoxy. The allowable grind area shall not exceed 0.25 square foot per location, and the maximum total grind area shall not exceed 1 square foot per item or piece of equipment. Do not use any item, pipe, or piece of equipment in which these requirements cannot be met.
2. Remove surface imperfections, such as slivers, scales, burrs, weld spatter, and gouges. Grind outside sharp corners, such as the outside edges of flanges, to a minimum radius of 1/4 inch.
3. Uniformly preheat the pipe, item, or piece of equipment prior to blast cleaning to remove moisture from the surface. The preheat shall be sufficient to ensure that the surface temperature is at least 5°F above the dew point temperature during blast cleaning and inspection.
4. Sandblast surfaces per SSPC SP-5. Protect beveled pipe ends from the abrasive blast cleaning.
5. Apply lining and coating by the electrostatic spray or fluidized bed process. Minimum thickness of lining or coating shall be 15 mils. Heat and cure per

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the epoxy manufacturer's recommendations. The heat source shall not leave a residue or contaminant on the metal surface. Do not allow oxidation of surfaces to occur prior to coating. Do not permit surfaces to flash rust before coating.

B. Shop Application of Fusion-Bonded Epoxy Lining and Coating to Pipe--Additional Requirements

1. Apply lining and coating per AWWA C213 except as modified herein.
2. Grind 0.020 inch (minimum) off the weld caps on the pipe weld seams before beginning the surface preparation and heating of the pipe.

C. Quality of Lining and Coating Applications

The cured lining or coating shall be smooth and glossy, with no graininess or roughness. The lining or coating shall have no blisters, cracks, bubbles, underfilm voids, mechanical damage, discontinuities, or holidays.

D. Factory Testing of Coating--General

1. Test linings and coatings with a low-voltage wet sponge holiday detector. Test pipe linings and coatings per AWWA C213, Section 5.3.3. If the number of holidays or pinholes is fewer than one per 20 square feet of coating surface, repair the holidays and pinholes by applying the coating manufacturer's recommended patching compound to each holiday or pinhole and retest. If the number of pinholes and holidays exceeds one per 20 square feet of coating surface, remove the entire lining or coating and recoat the item or pipe.
2. Measure the coating thickness at three locations on each item or piece of equipment or pipe section using a coating thickness gauge calibrated at least once per eight-hour shift. Record each measured thickness value. Where individual measured thickness values are less than the specified minimum thickness, measure the coating thickness at three additional points around the defective area. The average of these measurements shall exceed the specified minimum thickness value, and no individual thickness value shall be more than 2 mils below or 3 mils above the specified minimum value. If a section of the pipe, item, or piece of equipment does not meet these criteria, remove the entire lining or coating and recoat the entire item or piece of equipment.

E. Factory Testing of Lining and Coating of Pipe--Additional Requirements

Check for coating defects on the weld seam centerlines. There shall be no porous blisters, craters, or pimples lying along the peak of the weld crown.

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F. Field Repairs

Patch scratches and damaged areas incurred while installing fusion-bonded epoxy coated items with a two-component, 80% solids (minimum), liquid epoxy resin. Wire brush or sandblast the damaged areas per SSPC SP-10. Lightly abrade or sandblast the coating or lining on the sides of the damaged area before applying the liquid epoxy coating. Apply a two-part epoxy coating to defective linings and coatings to areas smaller than 20 square inches. Patched areas shall overlap the parent or base coating a minimum of 0.5 inch. If a defective area exceeds 20 square inches, remove the entire lining and coating and recoat the entire item or piece of equipment. Apply the liquid epoxy coating to a minimum dry-film thickness of 15 mils.

END OF SECTION

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SECTION 330521 PIPE RAMMING OF STEEL SURFACE CASING

PART 1 - GENERAL

A. Description

This Section addresses materials and construction of steel surface casing pipe(s) installed by pipe ramming for the containment of the HDD operation for the installation of pipelines. Pipe ramming operations shall apply to the trenchless pipe installation method where the casing pipe(s) is driven into the ground through the use of an impact hammer, normally air or hydraulic, located at the pit end of the casing pipe. The leading edge, or cutting shoe, is driven into the ground. The spoils are removed, typically with an auger or reaming tool after the casing is driven.

A surface conductor casing shall be installed by pipe ramming at both the entry and exit points as shown on the drawings and as follows:

1. Santa Maria River side: Conductor casing shall have a minimum length of 250 feet with the leading edge buried in the "Older Alluvium".
2. Nipomo Mesa side: Conductor casing shall have a minimum length of 200 feet with the leading edge buried in the "Sand Dune deposits".
3. Following installation of the carrier pipe, the annular space between the conductor casing that is left in-place and the carrier pipe shall be (grouted) (backfilled with concrete) per Section 330527.
4. The pipe ramming tool shall be kept onsite through completion of the pullback operation.

B. General Requirements and Scope

1. This Specification defines in general terms the Work to be accomplished. The Contractor shall have sole responsibility for the means and methods utilized to install the conductor casing(s) to the lines and grades shown and for preventing settlement or heave, all within the tolerances specified herein and subject to review by the Owner.
2. Perform all Work to provide appurtenances shown, specified, and required for the construction of the conductor casing(s). Install surface casing(s) to the depths and lengths shown on the drawings prior to reaming with the horizontal directional drilling equipment.
3. The surface casing shall be of the minimum diameter indicated on the drawings and this specification.

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4. Provide all items required to complete the Work by pipe ramming operation including, but not limited to, the ramming system, pit excavation, spoil removal, hoisting, lifting, safety, and control equipment.

C. Definitions: See Section 330525.

D. Quality Assurance: Experience Requirements:

1. Pipe Ramming Operator: The equipment operator shall have at least 3 years experience in the installation of pipelines using pipe ramming as the method of installation. The operator(s) shall have successfully completed a minimum of five pipeline projects each with a minimum of 200 L.F. of installed pipe with an internal diameter between 32 and 48 inches in diameter using pipe ramming as the method of installation. Pipe ramming operator(s) qualifications shall also include:
 - a. One of the referenced projects shall have operated pipe ramming equipment and/or location control system similar to the one proposed on this Work.
 - b. One of the referenced projects shall be a successfully completed drive having installed the same type of pipe casing material as used in this Work.
 - c. One of the referenced projects shall be a successfully completed drive in similar ground conditions to those anticipated in this Work including, but not limited to, soil type, soil strength as measured by "N" values, and hydrostatic head.
 - d. One of the referenced projects shall be a successfully completed drive of a length at least 80% of the longest drive length required on this Work with a casing between 32 and 48 inches.
 - e. One of the referenced projects shall include the application of telescopic conductor casings for HDD operations.
2. Experience Listing Requirements: Submit an experience record for item 1 above. The list of projects shall include shall include:
 - a. The name and location of the project, the owner's name, address, contact person and telephone number.
 - b. The Design Engineer's name, address, contact person and telephone number.
 - c. The Resident Engineer's and/or Construction Manager's name, address, contact person and telephone number.

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- d. A description of the project, scope of work performed, total value of construction, total value of change orders, construction duration, time extensions granted.
- e. The name of the proposed project superintendent and proposed operator and locator instrument operator and their resumes.

E. Allowable Settlement/Heave: See Section 330525

F. Surveys: See Section 330525.

G. Reference Codes and Standards: See Section 330525.

H. Submittals

Submit Shop Drawings in accordance with the General Conditions and Section 013300.

1. Contractor's experience record and qualifications.
2. Certification for the welders to perform onsite welding.
3. Construction Method and Sequence of Operations:

Provide Contractor's Work Plan which includes a description of the proposed method of construction and the sequence of operations to be performed during construction. Demonstrate to the Owner that the proposed means and methods shall complete the Work in accordance with the Specifications, this Section, Applicable Codes, and the Construction Schedule. Include the following:

- a. A general description and schedule of the pipe ramming procedure including, but not limited to, pit construction, set-up of pipe ramming equipment, method of spoil removal, spoil disposal, disposal location, methods of protection and maintenance of project site.
 - b. Preprinted machine specifications from the manufacturer demonstrating that the selected equipment is capable of progressing through the anticipated soil conditions including, but not limited to, similar soil type, soil strength as measured by "N" values, and hydrostatic head.
4. Working Drawings/Work Plan:
 - a. Layout of pits, pipe ramming equipment, and above ground equipment at each pit location.
 - b. Pit ventilation system details.

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- c. Electrical system, lighting system, and onsite power generation.
- d. Grade and alignment control system details.
5. Details of lubrication system proposed and lubrication formulations.
 - a. Submit Material Safety Data Sheet (MSDS) for additives.
 - b. All additives shall be NSF 060 Clean water approved or equal.
 - c. Water quality required for proper material mixing and source of water.
6. Submit pipe ramming equipment thrust details, including capacity, and method of control to prevent the maximum allowable force from being exceeded. Theoretical ramming force calculations provided to the Owner shall be stamped and signed by a licensed professional engineer (PE) registered in the State of California.
7. A proposed contingency plan for potential situations that may occur during pipe ramming operations shall be provided for the following scenarios.
 - a. Ramming operation seizes with the equipment on site.
 - b. The installation forces increase rapidly and reasonable concern exists for completing construction.
8. A safety plan for personnel conducting the pipe ramming operations and appurtenances installation.
9. Pipe Ramming Operations Log:
 - a. Provide a sample of logging reports and daily reports prior to beginning operation.
 - b. Transcribe to paper and submit to the Owner at the end of each shift the operations log, which shall include, as a minimum the following:
 - 1) Position of the pipe ram in relation to design line and grade.
 - 2) Number of each pipe and length of pipe.
 - 3) Maximum forces exerted on the pipe.
 - 4) Starting and finish times for each crew shift each day.

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- 5) Welding duration and number of welders.
 - 6) Maximum ramming pressure.
 - 7) Volume of lubrication used, and its viscosity, gel strength, and density as mixed.
 - 8) Observations for settlement, heaving, and hydrofracture.
10. Provide a noise and vibration mitigation plan addressing how the Contractor will mitigate noise and vibration levels in excess of specified levels stated in Section 011160.
- I. Safety: See Section 330525.
- J. Related Work Specified Elsewhere:
1. Measurement and Payment: 012000
 2. Submittals: 013300
 3. Horizontal Directional Drilling: 330525
 4. Annular Backfill Grouting: 330527
 5. High Density Polyethylene (HDPE) Pipe: 402097

PART 2 - PRODUCTS

A. Materials

1. Conductor Casing Pipe: Non-Pressure structural Casing Pipe shall be specifically designed for pipe ramming installation and conform to appropriate specifications:
 - a. Steel pipe: ASTM A139 Grade B, API 5L, or equal.
 - b. Welding: API 2B.
 - c. 48-inch steel casing shall have a minimum wall thickness of 1.0 inch.
 - d. 42-inch steel casing shall have a minimum wall thickness of 1.0 inch.
 - e. Larger casing sizes with equivalent factor of safety may be submitted and may be approved by the Owner at no additional cost to the Owner.

B. Lubrication

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1. Lubrication shall consist of bentonite and/or polymers and water. Contractor shall bear expense of obtaining water from a potable water source.
2. Use NSF 060 or equal, clean water-approved materials only.

C. Equipment

1. General: The pipe ramming equipment selected shall be specifically designed for excavating the soil materials anticipated along the alignment of the proposed pipeline.
2. Pipe Ramming Equipment: Use equipment that is capable of handling the various sizes of conductor casing pipe diameters, various anticipated ground conditions, drive lengths, and HDD drill string. Air compressor is to be sized to operate hammer correctly. Hammer assembly is to consist of a one piece casing and no fasteners (bolts, screws, or welding) are to be used to secure the control stud assembly.
3. Safety Equipment: Provide all appropriate safety equipment as necessary for the Contractor's method and operation of construction and as required by all applicable Laws and Regulations.

PART 3 - EXECUTION

A. Pit(s)

1. Construct pits for pipe ramming operations in accordance with these requirements.

B. Work Area Preparation and Maintenance: See Section 330525.

C. Installation

1. Alignment Establishment: Construction survey staking will be provided by the Owner as described in Section 007300.
2. Tolerances:
 - a. Conductor Casing Pipe installation shall not vary by more than 2.0 feet in horizontal alignment or 1.0 feet in vertical elevation from any design point.
 - b. Conductor Casing Pipe shall maintain slope within $\pm 0.5\%$.

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- c. If allowable tolerances are exceeded, correct. If redesign is required, obtain the services of a Professional Engineer registered in the State of California. Submit Plans and calculations to the Owner's Representative showing the proposed changes to remedy the non-compliant installation.
 - d. Perform a verification survey of the installed conductor casing after removal of the spoils and before the next operational sequence. Document measured conformance to design line and grade of the pipe together with locations and deviation (distance and direction) of any out-of-tolerance locations.
3. Installation of Conductor Casing Pipe:
- a. Provide a minimum of three days advance notice to the Owner prior to any pipe ramming. Do not pipe ram unless the Owner's representative is present.
 - b. Conduct pipe ramming operations in accordance with applicable safety rules and regulations and use methods that include due regard for safety of workers, and protection for adjacent structures, utilities, and the public.
 - c. Keep excavation within the rights-of-way indicated on the Contract Drawings, within the lines and grades designated on the Contract Drawings, and within the tolerances of Section 330525.
 - d. Locate equipment powered by combustible fuels at suitable distances from pit(s) and protect equipment to prevent the possibility of explosion and fire in pit(s) or the pipe.
 - e. Make the excavation at a minimum sufficient size to permit casing pipe installation with allowance for the lubrication into the annular space.
 - f. Maintain an envelope of lubrication around the exterior of the pipe during construction to reduce the exterior friction and possibility of the pipe seizing in place.
 - g. If the pipe "freezes" and the pipeline is unable to be moved, a recovery access pit may be permitted with the location subject to review by the Owner. The bid price shall include all costs associated with recovery, including but not limited to permits, pit construction, demolition and replacement, and utility relocation. Recovery pit construction shall be performed in accordance with the requirements.
4. Obstructions during Pipe Ramming Operations:

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- a. Remove, clear, or otherwise make it possible for the pipe ramming operation to progress past or through objects in accordance with the Contractor's submitted contingency plan.
 - b. Notify the Owner immediately upon encountering an object that stops the forward progress of the Work.
 - c. Proceed with removal of the object by means of obstruction removal procedures in accordance with the Contractor's approved submittals.
- D. Noise and Vibration Monitoring and Abatement: See Section 011160.
- E. Disposal of Muck and Excess Material: See Section 330525.
- F. Site Cleanup: See Section 330525.
- G. Quality Control: See Section 330525.

END OF SECTION

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SECTION 330525 HORIZONTAL DIRECTIONAL DRILLING

PART 1 – GENERAL

1-1. DESCRIPTION

1-1.01. This Section specifies the materials and construction procedures for the installation of a carrier pipe by a multiple pass directionally controlled drilling operation known as Horizontal Directional Drilling (HDD).

1-1.02. The WORK of this Section shall be performed by an HDD contractor pre-qualified by the DISTRICT. The DISTRICT has pre-qualified the following HDD Contractors:

- (Add list of approved contractors; TBD)

1-2. SCOPE

1-2.01. Perform all WORK to install a complete and operable buried pipe, specials, and appurtenances specified and required.

1-2.02. Install the carrier pipe using HDD methods.

1-2.03. Excavate the pilot hole using a mid-path intercept.

1-2.04. Horizontal directional drilling is defined as creating a pilot hole in an inverted arc which is subsequently enlarged to a larger diameter during a secondary operation. Subsequent operations may include multiple incremental hole enlargements, as required to permit pullback of the carrier pipe. Tracking of the initial pilot path shall be accomplished by an electronic guidance component located in the drill head that transmits location information through a wire or other method to the HDD operator for steering and locating the pilot path. A beacon antenna or wire line survey system shall be utilized to accurately track the horizontal and vertical location of the drill head at all times. A walk-over receiver can be used; but is not an acceptable alternative for this installation.

1-2.05. The CONTRACTOR shall assume responsibility for the stability and accuracy of the drilling, enlarging hole, and pits constructed, and costs for damages resulting from any failure thereof.

1-2.06. The CONTRACTOR shall be responsible for the safety of the pits and related structures including personnel engaged in underground construction throughout the duration of the WORK.

1-2.07. The CONTRACTOR shall follow the general dimensions, arrangement, and details for the drill hole as indicated on the Contract Drawings. Equipment

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and procedures of the HDD operation shall be selected by the CONTRACTOR to provide adequate working space and clearances for the WORK to be performed.

1-2.08. The CONTRACTOR shall be responsible for cleanup and disposal of all remaining imported or excavated spoils, trash, and debris to an acceptable disposal location.

1-2.09. Provide one new or reconditioned spare mud motor in a fully operational condition and maintain it onsite as a standby unit throughout the entire duration of the pilot hole drilling operation.

1-3. PROJECT CONDITIONS

1-3.01. Refer to Geotechnical Baseline Report (GBR).

1-3.02. Refer to Section XXXX

1-3.03. Schedule Constraints: Refer to Section 013216, "CPM Construction Schedule Requirements."

1-4. UTILITIES

1-4.01. Locate all utilities and structures prior to start of excavation or drilling in accordance with Section 020120, "Protecting Existing Underground Utilities". Expose and verify the location of all utilities and structures crossed or approached with less than a 60-inch separation from the excavated hole. Use visual verification to verify that the drill, conductor casing, reamer, and carrier pipe do not damage the utility or structure as it passes.

1-4.02. Utility lines and structures indicated on the Plans shall remain in service and protected from damage as a result of the CONTRACTOR's operations.

1-5. QUALIFICATIONS

1-5.01. Subcontracted work shall not be included as experience.

1-5.02. The CONTRACTOR's project manager and superintendent in responsible charge of HDD for this project shall be experienced in work of this nature and shall have successfully completed at least three (3) projects over the last three years using HDD. The projects listed shall meet the following three criteria:

1. One project shall be of the same length or longer with a pipe diameter at least 80% of this installation. Or the project shall be of the same outside

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diameter (OD) or larger and at least 80% of the same length of this installation.

2. One project shall be constructed within a similar soil type as measured by N value, groundwater, and soil classification.
3. One project shall be completed using the same pipe material.

1-5.03. The HDD Operator and tracking system operator for this project shall be experienced in work of this nature and shall have successfully completed five (5) projects over the last three (3) years using HDD. Two projects shall be of the same length or longer as this HDD installation with a pipe at least 80% of the same outside diameter (OD) or a pipe the same OD or larger and 80% of the length of this HDD installation. One project shall be constructed within a similar soil type as measured by N value, groundwater, and soil classification. One project shall be completed using the same pipe material.

1-5.04. The CONTRACTOR's Engineer preparing HDD calculations shall be a Registered Professional Engineer in the State of California and shall have performed similar design calculations on at least five projects over the last five years using HDD. Two of the reference projects shall have used the same pipe material. Two projects shall have the same or longer length of installed carrier pipe. One project shall have the same or larger carrier pipe OD. One project shall be completed using the same pipe material.

1-5.05. The welder shall have training acceptable to the pipe supplier and to the DISTRICT. The welder shall have successfully completed at least 2,000 feet of HDPE pipe welding in each of the last three years.

1-6. MINIMUM DESIGN CRITERIA

1-6.01. The Contractor shall use HDD and perform a mid-path intercept.

1-6.02. The directional tolerance of the pilot hole and carrier pipe shall be as follows:

1. Vertical tolerance – Plus or minus one foot from the centerline of the theoretical alignment of carrier pipe, as shown on the approved working drawings.
2. Horizontal tolerance – Plus or minus three feet from the centerline of the theoretical alignment of carrier pipe, as shown on the approved working drawings.

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3. At no location shall the pilot hole excavation create a path that locates the carrier pipe or excavation in violation of any permit or easement.
4. Curve radius – Curves shall be drilled at a radius no less nor no more than 5 percent of the curve radii shown on the approved working drawings. The drill radii shall be calculated over three continuous drill steel segments.
5. Entry point locations – The pilot hole shall enter the ground as indicated on the approved working drawings.

1-6.03. Drill entrance angles shall be as indicated on the approved working drawings.

1-6.04. Design calculations shall be completed using an industry accepted method such as ASTM, API, or other standard acceptable to the DISTRICT. All calculations shall be completed with conservative assumptions. Incremental filling of the carrier pipe will be permitted.

1-6.05. A steel conductor casing shall be installed by pipe ramming at both the entry and exit points. See Section 330521 “Pipe Ramming of Steel Surface Casing”.

1-7. DEFINITIONS

- Annular Space. The open volume created by the difference in the radial distances as measured from the outside radius of the carrier pipe(s) to the excavated hole along the entire pipeline and/or the open volume created by the difference in the radial distances. The interior annular space is measured from the outside radius of the carrier pipe(s) to the interior radius of the casing pipe along the encased pipeline sections.
- Carrier Pipe(s). As it relates to this WORK, a pipe which conveys potable water. See Section 402097 “High Density Polyethylene (HDPE) Pipe”.
- Conductor casing. Steel casing pipe typically installed by pipe ramming through which the HDD operation is later completed. Purpose of a conductor casing is to contain drill fluids and prevent the inflow of ground. A conductor casing may serve as a casing pipe to contain a pipeline as required by a regulatory agency or right-of-way owner.
- Controls. The system that synchronizes drilling, removal of excavated material, pushing of drill steel, and pulling of pipe to maintain adequate ground support at all times.

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- Drill Steel. Specialty manufactured steel pipe segments used to provide forward thrust and provides rotation to the drill tool. The drill steel is extended, as the excavation process advances, by joining individual segments to become the drill string. The drill string transports Driller's Mud from the surface to the point of excavation. The drill string is pushed during the drilling process and during forward reaming. The drill string is pulled upon during back reaming and pipe pullback.
- Drill Tool. Any rotating tool or system of tools on a common support which excavates and/or provides directional control.
- Driller's Mud. A fluid, normally consisting of water, bentonite, and polymers, used to stabilize the hole and in a closed loop system for the removal of spoil. Driller's Mud is a fluid designed with specific engineering properties which may include density, viscosity, and gel strength.
- Entry Pit. Location where the pilot hole is begun by the drill tool entering the ground.
- Exit Pit. Location where the pilot hole ends by the drill tool exiting the ground.
- Geologic Contact Line. An interface between two geological strata. See Drawing C-201 "HDD Profile".
- Geotechnical Baseline Report (GBR). A report written for the project by the DISTRICT which establishes the ground conditions the CONTRACTOR is to assume during the bidding and planning phases of the project.
- Guidance System (Location Control System). System that provides three dimensional location and attitude of the drill tool to the HDD operator during the pilot drill operation. System is typically comprised of a sonde, computer, and surface magnetic field generator. The HDD operator acts upon this information to provide steering for installing the pipeline to the designed alignment and within the design tolerance. System may be used in subsequent reaming, swabbing, and carrier pipe(s) pullback operations.
- Guidance System Operator. Person that is responsible for operating Guidance System.
- Hole. Open excavation, which is supported through the use of Driller's Mud, and into which the casing or carrier pipe(s) is later installed.
- Inadvertent Return. The loss of Driller's Mud from the system. A common form of inadvertent return, where the fluid reaches the surface or waterway, is commonly called a "frac-out."

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- Jetting. High-pressure Driller's Mud sprayed from nozzles in the drilling tool in the direction of the excavation and used to assist in excavation.
- Location Control System. See Guidance System.
- Maximum Anticipated Reaming Force and Torque. The maximum anticipated tensile and rotational force required to advance the reamer as documented in the GBR.
- Mud Motor. Motor located on the cutter tool that uses pressurized Driller's Mud to provide rotational power to the rock cutting drill tool.
- "N" Value. Number of blows required to drive a soil sampler 12 inches into the ground using a 140-pound hammer, dropped 30 inches.
- Obstruction. An unforeseen object that lies either fully or partially in the direct path of the HDD operation and prevents its progress along the intended path.
- Pilot Hole Excavation. The first HDD operational sequence where the drill tool and drill steel are pushed from the HDD equipment through the ground to the exit point.
- Pit. Temporary excavation used to access subsurface improvements and/or construction.
- Pullback. The HDD operational sequence where, for this project, the carrier pipe is pulled into and through the hole back to the HDD equipment at the entry point.
- Reaming. The HDD operational sequence where the pilot hole or excavated hole is being enlarged. Back reaming has the operational forces exerted towards the HDD equipment. Forward reaming has the operational forces exerted away from the HDD equipment.
- Receiving/Exit Pit. Excavation into which the pilot hole is initially drilled towards and/or recovered from.
- SDR. Abbreviation for "Standard Dimension Ratio", relates to wall thickness of class HDPE pipe.
- Separation (as used for measuring distance between objects). The distance between two objects as measured between the closest outermost dimensions.
- Slurry: A fluid that is used to transport solids, i.e., spoils. For this project, the slurry is a Driller's Mud.

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- Slurry Separation. A process where spoils are separated from the circulating Driller's Mud.
- Spoil(s). Unclassified materials and Driller's Mud removed during excavation and drilling.
- Surface Settlement Points. Survey Control Points established at the ground surface, below the ground surface, or on man-made structures along the pipe alignment used for monitoring movement, settlement or heave, due to subsurface excavation.
- Swab. An HDD operational sequence wherein the excavated hole is stabilized and cleared by the passing of a special hole sized tool. This step is typically performed just before the pullback. This operation typically has the operational forces exerted towards the HDD equipment.

1-8. SAFETY, CODES, AND REGULATIONS

1-8.01. The CONTRACTOR shall perform work in accordance with equipment manufacturer's safety requirements. It is the CONTRACTOR's responsibility to ensure that personnel protective equipment necessary for the various working conditions is available and utilized by all his staff and subcontractors.

1-8.02. Operators of the drill rig shall wear electrical shock protection equipment and operate from common grounded mats as required.

1-8.03. Installation shall be in compliance with CalOSHA Tunnel Classification when required.

1-8.04. The CONTRACTOR shall comply with all applicable regulations including:

- The "General Construction Safety Orders" and "Trench Construction Safety Orders" of the State of California, Department of Industrial Relations, Division of Occupational Health and Safety.
- Confined space entry requirements of the State of California and the Federal Government.

1-9. QUALITY ASSURANCE

1-9.01. The CONTRACTOR shall be responsible for quality assurance for the duration of the project.

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1-9.02. The CONTRACTOR shall maintain a complete set of project records. The CONTRACTOR shall maintain a daily activity log during the entire HDD operation.

1-9.03. The CONTRACTOR shall perform the following:

1. Obtain all applicable permits for earthwork, work in roads, right-of-way, etc., as required by local, state, and federal agencies.
2. Comply with all construction dewatering discharge requirements elsewhere in these specifications.

1-9.04. Welders shall be certified to the procedure and process called for in the work, and certification papers shall be on file with the Contractor at the jobsite or in possession of welders at all times. Certificates for the welders shall be current for the project duration.

1-9.05. Provide an inadvertent return plan including inspecting the surface and waterways shall include, a minimum of site inspection every 2 hours during pilot hole excavation and when operating parameters or observations indicate an inadvertent return. The plan shall include a **minimum 4-hour shutdown period** upon the discovery of an inadvertent return for containment upon discovery, cleanup, and restoration.

1-9.06. Provide horizontal coordinates and elevations for each survey point location to an accuracy of 0.01 foot.

1-10. SUBMITTALS

1-10.01. The CONTRACTOR shall submit the following information to the DISTRICT:

1. HDD equipment manufacturer's preprinted specification sheet or letter demonstrating HDD rig meets minimum reaming, pullback, and torque requirements.
2. Drawings or annotated photographs of down-hole tools that the work plan identifies for use. Include alternate down-hole tools.
3. The drilling fluid mixture and content of additives include generic mixing instructions. The CONTRACTOR shall supply an estimate volume of the drilling fluids to be utilized for each reaming cycle.
4. A complete list of all drilling fluid additives that will be on site.

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5. A detailed reaming process including the number and direction of reaming passes, sizes and types of reamers and tooling, anticipated slurry pressure, excavated volume, and anticipated slurry volume.
6. Type of tracking method to be used.
7. Contingency plans required in the permits issued by the Agencies having jurisdiction over the river crossing.
8. Operational parameters monitored to identify potential inadvertent returns. Develop and document a site inspection plan to locate an inadvertent return independent of monitoring operational parameters. Include inspection of the river and areas when the HDD excavation is within 200 feet of areas identified as a potential inadvertent return locations.
9. Details on removal and disposal of spoils.

1-10.02. Provide the following pre-construction submittals:

1. An organization chart with contact information within five working days following the Notice to Proceed. Organization chart shall include on-site safety person, project manager, superintendent, project engineer, HDD operator, guidance operator, separation plant operator, and mud mixing operator.
2. Experience records of all projects demonstrating the required experience. The experience record shall include name of project, name of project owner, name of project contact including all contact information, conductor casing pipe material, ground conditions, longest bore planned and completed, and total footage planned and completed. If HDD work was performed as a subcontractor, the record shall include name of general contractor, name of contact, and all contact information.
3. Sample daily log and HDD operations log demonstrating required information will be collected.
4. Material safety data sheets for all drilling fluids and additives.
5. Verification of downhole surveying equipment calibration prior to initiation of the WORK. The surveying equipment shall have the ability to track pitch, roll, depth, and azimuth information for real time monitoring, tracking and surveying of the drill head. A 360 degrees test roll must be successfully documented before initiation of work.

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6. Carrier pipe manufacturer's written shipping, handling, welding, repair, and testing procedures.
7. Location and method of final disposal of the spoils.
8. Documentation and calculations showing that the proposed means and methods shall allow completion of the work in accordance with the Specifications, Codes, and the Construction Schedule. Provide the following:
 - a. A plan of the Santa Maria River and Nipomo Mesa sites, a general description of the HDD procedure including, pit construction, conductor casing installation, set-up of HDD equipment, number of reaming sequences, method of spoils removal, spoil disposal volume, and methods of maintaining and protecting the jobsite.
 - b. A plan describing the method of construction including major activities such as conductor casing installation, pilot bore, each reaming pass, carrier pipe build-up, pullback, and inspection.
 - c. A plan for the installation of carrier pipe, including the method of installation, filling of the carrier pipe during installation as required by the calculations, location of pipe joint welding and staging area, and equipment to be employed.
 - d. Reference source of calculations to be used before submitting calculations. Calculations shall include acceptance tolerances for final installation.

1-10.03. Provide the following documentation during and after construction:

1. Daily Logs: Submit at the end of each shift. These documents shall include:
 - a. Start and finish time of each section of drill pipe for pilot hole drilling, reaming, swabbing, and pipe pullback.
 - b. For pilot hole drilling, drill bit location shall be marked at least every 30 feet along the drill path.
 - c. General description for each ground condition drilled.
 - d. Details and perceived reasons for delays greater than one hour other than normal breaks and shift changes.
 - e. Details of any unusual conditions or events.

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2. HDD Operations Log:
 - a. Position of the drill tool in relation to design line and grade at least every 30 feet along the drill path.
 - b. Steering action intended by operator as measured by inclination and position of location at each location at least every 30 feet along the drill path.
 - c. Number of drill steel, length of each drill steel, and time and date of use.
 - d. Maximum forces exerted on the pipe and/or drill steel. Forces include torque, tons pushed or pulled at least every 30 feet along the drill path.
 - e. Start and finish times for each crew shift each day.
 - f. Slurry operating pressure shall be recorded and compared to the planned pressure at least every 30 feet along the drill path.
 - g. Torque value shall be recorded at least every 30 feet along the drill path.
 - h. Maximum hydraulic pressure and distance to drill bit shall be recorded at least every 30 feet along the drill path.
 - i. Observations for settlement, heaving, and hydrofracture shall be recorded at least every 30 feet along the drill path.
 - j. Mud motor operations, if used, including required slurry pressure and pressure drop across mud motor shall be recorded at least every 30 feet along the drill path.
3. Receipts indicating legal disposal of all spoils within one business day following disposal.
4. Certification for the welders to perform onsite welding.

1-10.04. Provide contingency plans which include a list of personnel to notify with emergency telephone numbers. Plan shall include notification requirements, people, equipment, vendors, and materials needed but not maintained on the project site. Plan shall include a list of materials and equipment maintained on site for each contingency plan developed for the condition when:

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1. Spoils test positive for naturally occurring hydrogen sulfide and/or petroleum occurrences. Include plan to minimize impacted spoils generation and plan to mitigate any cost and schedule impacts to DISTRICT.
2. Spoils do not settle/separate with the slurry separation equipment on site.
3. Drill steel/pipeline is unable to be advanced or retrieved with drill rig.
4. Drill tool lost in the hole.
5. The location control system fails to provide accurate information. Describe which operational parameters are observed, measured, or recorded so that it can be determined if the above is occurring or has just occurred.
6. The installation forces start to move up rapidly and reasonable concern exists for completing construction.
7. A swivel breaks during carrier pipe(s) installation.
8. Inadvertent returns occur in a river or on dry land.
9. An inadvertent return occurs where slurry fails to return due to subsurface ground conditions, such as encountering a gravel bed that serves as an aquifer.
10. An inadvertent return plan including inspecting the surface and waterways at the end of each shift, prediction of Driller's Mud pressure as drill path advances, monitoring Driller's Mud pressure as drill path advances, description of instrumentation used for identifying inadvertent returns, and describe affects an inadvertent return has on instrumentation.
11. The pilot hole or ream intersects a subsurface interface and directional steering is unable keep the drill path along the intended route. Describe which operational parameters are observed, measured, or recorded so that it can be determined if the above is occurring or has just occurred.
12. Loss of directional steering information. Describe which operational parameters are observed, measured, or recorded so that it can be determined if the above is occurring or has just occurred.
13. Loss of steering, inability to steer. Describe which operational parameters are observed, measured, or recorded so that it can be determined if the above is occurring or has just occurred.

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1-10.05. Submit the following working drawings and calculations:

1. Layout drawings at each work area showing set-up including HDD and slurry separation plant within the work area.
2. Drawings showing drill tool, reamers, and all other down-hole tools.
3. Drawing showing pullback assembly configuration.
4. Drawing showing details of traffic control and site security.
5. Drawing of each drill path showing confirmed location of all known utilities and that excavation will avoid all known utilities by required separation.
6. Description of equipment thrust and pullback system details, including capacity, and method of control to prevent the maximum allowable force from being exceeded.
7. Theoretical pullback force calculations which include maximum allowable pulling capacity. Determine the maximum anticipated construction loads and ensure that the anticipated loads are implemented in the manufacturer's design of the carrier pipe(s). Calculations shall clearly state when carrier pipe is filled with water.
8. Theoretical calculations predicting Driller's Mud pressure during pilot hole excavation along the intended drill path to identify pressure at the HDD rig and upon exiting the drill tool.
9. Calculations predicting the percentage of spoils removed from the completed borehole in order to accommodate the carrier pipe installation.
10. Calculations after reaming has been completed and before pullback of the carrier pipe commences demonstrating agreement with the actual amount of spoils removed from the completed borehole.
11. Pipeline design calculations demonstrating the pipeline as-built will perform as intended based upon the actual drill path.

1-10.06. Provide information on the slurry system and slurry separation methods for the anticipated ground conditions.

1-10.07. Provide the Driller's Mud formulation for the anticipated ground conditions and sample record log for testing of the Driller's Mud. Record shall include at a minimum time and date of testing, properties to be tested, test results, material and quantity added, test results after modifications. Formulation shall follow manufacturer's written recommendations.

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1-10.08. Provide calculations for the carrier pipe and state installation requirements including fluid inside of the carrier pipe, filling of carrier, and slurry density.

1-10.09. Provide information on the HDD equipment including equipment size, hydraulic rotational pressures to torque and push and pull hydraulic pressure to pounds, Driller's Mud circulation monitoring for volume and pressure. Provide any conversion factors required for calculations.

1-10.10. Provide information on the grout material used for backfilling the annular space between the casing and carrier pipe.

1-10.11. Provide survey plans of anticipate drill path and as-built upon completion of pilot hole excavation.

1-10.12. Submit an Illness and Injury Prevention Plan (IIPP) to the DISTRICT for information only.

1-10.13. Provide inspection and test reports, including the following:

1. Pressure test plan to be completed before commencement of pipe pullback.
2. Passing pressure test results before commencing pipe pullback.
3. Verification of pipe ovality and internal pressure upon completion of HDD pipe pullback.

1-10.14. Submit as-built information within 20 work days following completion of HDD pipe pullback. The as-built information shall include:

1. As-built drawings demonstrating pipeline is installed within design parameters.
2. Drawing comparing design with as-built.
3. As-built calculations demonstrating pipeline is constructed within design parameters. Calculations shall be signed and stamped by the same engineer as signed and stamped original calculations.
4. Passing results for ovality and internal pressure completed after completion of HDD pipe pullback in accordance with design calculations.

1-10.15. Provide the following surveys:

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1. Initial Survey: Record of horizontal coordinates and elevations for each survey point location. Reference survey points so that they may be accurately re-established if lost or destroyed.
2. The CONTRACTOR shall submit readings from the various survey points to the DISTRICT on the same day the readings are taken.
3. Final Survey: Submit a final survey reading of all control points established for observation to the DISTRICT 4 weeks after completing pullbacks.

1-11. PERMITS

See Section 011100 – Coordination of Work, Permits, and Regulations.

PART 2 – MATERIALS AND EQUIPMENT

2-1. MATERIALS

2-1.01. Carrier Pipe: The carrier pipe shall have a minimum wall thickness and strength to withstand operation and installation loads as a result of the installation method, procedure, equipment and practices used by the CONTRACTOR. See Section 402097 “High Density Polyethylene (HDPE) Pipe”. Design calculations shall state installation requirements including fluid inside of the carrier pipe, filling of carrier, and slurry density. Pipe shall be installed to meet the hydraulic design requirements.

1. The carrier pipe shall be manufactured and fusion welded in accordance with Section 402097.

2-1.02. Drilling Fluids: The CONTRACTOR shall use a high yielding bentonite or polymer for drilling mud to ensure hole stabilization, cuttings transport, bit and electronics cooling, and hole lubrication to reduce drag on the drill string and carrier pipe. All drilling mud additives other than soda ash, shall be NSF/ANSI Standard 60 if commercially available.

2-1.03. Water: The CONTRACTOR shall be responsible for obtaining, transporting and storing water required for drilling fluids. Drilling fluids shall be mixed with potable water to ensure no contamination is introduced into the soil during the drilling, reaming or the pipe installation process. All water shall be tested for pH and treated with soda ash, or approved equal, to adjust the pH of the water as required in the approved mix design(s).

2-1.04. Steel Surface Casing: See Section 330521.

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2-1.05. Grout: Provide grout material with a minimum unconfined compressive strength (UCS) of 500 psi.

2-1.06. Concrete: Provide concrete with a minimum unconfined compressive strength (UCS) of 4,000 psi at 28-days. Mix shall be Class A per Section 030500.

2-2. HDD EQUIPMENT

2-2.01. The requirement for meeting pull-back capacity and torque may be met with concurrent use of two drilling rigs meeting the following additional criteria:

1. The primary drill rig shall be capable of supplying a minimum of 80 percent of the maximum anticipated reaming force and torque and 100 percent of the pullback force.
2. The primary rig shall perform all reaming passes and the pullback.
3. The secondary drill rig shall be capable of supplying a minimum of 20 percent of the maximum anticipated reaming force and torque.
4. The drill string steel shall be connected to both the primary and secondary drill rigs during all reaming passes.
5. The drill string steel shall be capable of transmitting and withstanding 100 percent of the combined forces of the primary and secondary drill rigs.
6. Constant communication shall be maintained between both sides of the operation once the pilot hole excavation has commenced and until the carrier pipe is completely pulled into place.

2-2.02. Size the equipment for the anticipated ground conditions.

2-2.03. Select excavation tooling for the anticipated ground conditions.

2-2.04. Size the slurry separation equipment for the anticipated ground conditions and HDD equipment.

2-2.05. Maintain and operate the equipment consistent with the manufacturer's written recommendations, CalOSHA requirements, and any permit requirements.

2-2.06. Provide the HDD rig with a common grounding system to prevent electrical shock in the event of high voltage underground cable strike. The grounding system shall connect all pieces of interconnecting machinery; the drill, mud mixing system, drill power unit, drill rod trailer, operators' booth, worker grounding mats and any other interconnected equipment to a common ground.

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The drill rig shall be equipped with an “electrical strike” audible and visual warning system that notifies the system operators of an electrical strike.

2-2.-07. The HDD rig performing the reaming operations and pullback shall have, at a minimum, the capacity to pull 1.2 times the entire static weight of the carrier pipe and fiber optic conduits when laid out on the surface.

2-2.08. The HDD rig performing the reaming operations shall have at a minimum torque detailed as shown below:

General Description	Outside Diameter (inches)	Approximate Length (feet)	Torque (ft-lb)
Santa Maria River to Nipomo Mesa	30	2,650	45,000

PART 3 – EXECUTION

3-1. MOBILIZATION AND SITE PREPARATION

3-1.01. The CONTRACTOR shall mobilize all necessary personnel, equipment and materials to construct an entry and exit area for drilling operations.

3-1.02. The CONTRACTOR shall maintain safe working conditions, ensure stability of the entry and exit pits; and shall minimize loosening, deterioration and disturbance of the surrounding ground. The CONTRACTOR shall keep the site free of foreign materials, spoils, and trash. The CONTRACTOR shall arrange and conduct at least one project kick-off meeting with the DISTRICT, the ENGINEER, subcontractors, contractors of adjacent work, and the owner of utilities being crossed seven (7) days before commencing excavation.

3-1.03. The Santa Maria River Side of the crossing shall contain the secondary drill rig, drill pipe storage racks, water and slurry pumps, slurry mixing tank, cuttings separation equipment, entrance point slurry containment pit, additional tank storage as required, and dry storage area for bentonite. Runoff shall be prevented from discharging into the surrounding areas of the Santa Maria River side of the project.

3-1.04. The Nipomo Mesa Side of the crossing shall contain the primary drill rig, drill pipe storage racks, water and slurry pumps, slurry mixing tank, cuttings separation equipment, entrance point slurry containment pit, additional tank storage as required, and dry storage area for bentonite. Runoff shall be prevented from discharging into the surrounding areas of the Nipomo Mesa side of the project.

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3-1.05. The CONTRACTOR shall decide which end of the project to commence pilot hole drilling. Clean up of any inadvertent spills or overflows from these pits shall take place immediately without any delay.

3-2. HORIZONTAL DIRECTIONAL DRILLING

3-2.01. The directional drilled alignment and profile shall be in accordance with the approved working drawings.

3-2.02. A copy of this specification, drawing of the planned crossings and soils report shall be located with the HDD operator during HDD operations.

3-2.03. Provide a smoothly curved pilot hole following the designated centerline of the pipe profile as shown on the Contract Drawings. The directional tolerance of the hole shall be in accordance with the requirements of Paragraph 1-6.02 of this specification.

3-2.04. The CONTRACTOR shall at all times provide and maintain instrumentation which accurately measures and tracks pitch, roll, depth, and azimuth information for real time monitoring, tracking and surveying of the drill head, measure drill string axial and torsional loads, and measures drilling fluid charge flow rate and pressure and discharge flow rate. The DISTRICT shall have access to these instruments, readings and written output at all times.

3-2.05. The CONTRACTOR shall compute the position in the x, y and z axis relative to the ground surface from survey data at a minimum of once per length of each drill steel segment or 30 foot. Deviations between the recorded position of the drill string and the specified position of the drill string shall be documented and immediately brought to the attention of the DISTRICT. Corrections shall be made to maintain accuracy, unless otherwise approved by the DISTRICT.

3-2.06. Reaming operation, to the required hole size, shall be performed as submitted in the CONTRACTOR's approved work plan. The CONTRACTOR shall supply to the DISTRICT an estimate volume of the drilling fluids to be utilized for each reaming cycle.

3-2.07. The CONTRACTOR shall conduct all operations in such a manner as to avoid subsidence and heave. At a minimum, the CONTRACTOR shall survey accurately to 0.10" movement in any direction measured at the start and end of each day of pilot bore, back-reaming, and pipe installation.

3-4. SURVEY

3-4.01. Provide surface monitoring points when crossing under roadway, vegetation, and railroad locations. The surface monitoring points shall consist of

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a re-bar anchor as indicated. The CONTRACTOR shall ensure functionality of the instrument when measuring subsidence.

3-4.02. For each HDD crossing, the surface monitoring points shall be surveyed following installation, with a second survey completed before commencing HDD. The second survey shall follow the first survey by at least one work-day.

1. A total of 3 surface monitoring points shall be installed in TBD.
2. Survey points shall be installed at Station X+XX, XX+XX, and XX+XX along the centerline of the HDD alignment.
3. Survey shall be performed twice a day during excavation and once a week through four weeks following completion of the carrier pipe pull back.

3-5. PIPELINE ASSEMBLY AND INSTALLATION

3-5.01. The CONTRACTOR shall provide, assemble, and pretest the pipeline prior to installation in the drilled hole. The CONTRACTOR shall supply all necessary materials, equipment, and services to perform the pipeline assembly, testing, and installation. All WORK shall be performed by qualified personnel in a manner consistent with the approved submittals.

3-5.02. All piping shall be lifted using fabric slings with sufficient strength and width to safely pick up the pipe without strap failure and without causing scrapes or cuts to damage the pipe. Lifting with cable or chain shall not be permitted. Lifting one end of the pipe and dragging the pipe into position shall not be permitted. The pipe shall at all times, including installation, be protected from impact and abrasion. Pipe shall be stored on supports, blocking, or rollers at all times in a manner to prevent damage.

3-5.03. The CONTRACTOR shall provide adequate pipe supports and rollers along the laydown space to support the carrier pipe during assembly and installation to prevent abrasion to the coating.

3-5.05. The CONTRACTOR shall test the assembled carrier pipe prior to installation in the drilled hole. The CONTRACTOR shall supply all necessary materials, equipment, and services to perform the pipeline assembly, pretest, and installation.

3-5.06. The CONTRACTOR shall be responsible to provide all temporary fittings and pressure testing heads and work necessary to complete the above

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ground testing of the carrier pipe string and in-ground testing of the carrier pipe string after installation.

3-5.07. The CONTRACTOR shall, for carrier pipe assembled on the surface and before installed, perform a visual inspection. Any segment of the carrier pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than ten percent (10%) of the pipe wall thickness, shall not be used and shall be removed from the site.

3-5.08. All tests shall be 100 percent passing for all required inspections before commencing pullback.

3-5-09. The newly assembled carrier pipe shall be tested in accordance with the requirements of Section 402097 and Section 400515.:

3-6. ENVIRONMENTAL REQUIREMENTS

3-6.01. In addition to the requirements specified elsewhere, the CONTRACTOR shall be responsible for disposal of all spoils; conducted in compliance with all relative environmental regulations, right-of-way and work space agreements and permit requirements.

3-6.02. The HDD operation shall be a closed loop slurry system maintained to eliminate the accidental discharge of water, drilling mud, or spoils. The CONTRACTOR shall provide equipment and procedures to maximize the recirculation of drilling mud and to minimize waste.

3-6.03. Spoils shall be dewatered and dried by the CONTRACTOR to the extent necessary for disposal at approved site. CONTRACTOR shall test Driller's Mud, feed side, not less than 4 times per shift. Test intervals shall be approximately equally spaced intervals.

3-6.04. Inadvertent returns to the surface shall be cleaned up upon discovery and before the end of the shift. See Section 011160 (Mitigation Monitoring Compliance and Reporting) regarding the Project Frac-out Monitoring, Response, and Clean-up Plan. The surface area shall be washed and returned to the original condition. If the amount of surface returns exceeds the capacity of the small sumps being used for collect and contain surface returns, drilling operations shall be discontinued. Drilling shall not resume until contingency plan is implemented. Equipment, manpower, and materials for containment and cleanup shall be provided by the CONTRACTOR.

3-6.05. All construction-related activities involving fuels and lubricants such as vehicle refueling and equipment maintenance including draining and pumping of lubricants shall be conducted away from the water channel to eliminate

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contamination in case of a spill. Double containment during fueling or greasing operations shall be implemented as required by the California Fish and Game permit. Any fuels or lubricants spills shall be cleaned up upon occurrence and before the end of shift as required by the California Fish and Game law or permit.

3-6.06. The CONTRACTOR shall provide sanitation and garbage facilities on both sides of the crossing. Waste shall be collected and transported offsite for disposal.

End of Section

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SECTION 331300 DISINFECTION OF PIPING

PART 1 - GENERAL

A. Description

This section includes materials and procedures for disinfection of water mains by the continuous feed method. Disinfect piping in accordance with AWWA C651, except as modified below.

B. Related Work Described Elsewhere

Pressure Testing of Piping: 400515.

C. Job Conditions

1. Discharge of chlorinated water into watercourses or surface waters is regulated by the National Pollutant Discharge Elimination System (NPDES). Disposal of the chlorinated disinfection water and the flushing water is the Contractor's responsibility. [Dechlorinate the disinfection water such that the chlorine residual [does not exceed [_____] mg/L] [complies with California Regional Water Quality Control Board Order No. _____, NPDES No. CA_____] [complies with _____].]
2. Schedule the rate of flow and locations of discharges in advance to permit review and coordination with Owner and cognizant regulatory authorities: [_____]. The allowable locations of discharges are [described below:
 - a. _____]
3. Use potable water for chlorination.
4. Submit request for use of water from waterlines of Owner and/or the City of Santa Maria 48 hours in advance.

PART 2 - MATERIALS

A. Liquid Chlorine

Inject with a solution feed chlorinator and a water booster pump. Follow the instructions of the chlorinator manufacturer.

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B. Calcium Hypochlorite (Dry)

Dissolve in water to a known concentration in a drum and pump into the pipeline at a metered rate.

C. Sodium Hypochlorite (Solution)

Further dilute in water to desired concentration and pump into the pipeline at a metered rate.

D. Chlorine Residual Test Kit

For measuring chlorine concentration, supply and use a medium range, drop count, DPD drop dilution method kit per AWWA C651, Appendix A.1. Maintain kits in good working order available for immediate test of residuals at point of sampling.

PART 3 - EXECUTION

A. Continuous Feed Method for Pipelines

Introduce potable water into the pipeline at a constant measured rate. Feed the chlorine solution into the same water at a measured rate. Proportion the two rates so that the chlorine concentration in the pipeline is maintained at a minimum concentration of [50] [25] [_____] mg/L. Check the concentration at points downstream during the filling to ascertain that sufficient chlorine is being added.

B. Disinfection of Valves, Blind Flanges, and Appurtenances

During the period that the chlorine solution is in the section of pipeline, open and close valves to obtain a chlorine residual at pipeline appurtenances. Swab exposed faces of valves and blind flanges prior to bolting flanges in place with a 1% sodium hypochlorite solution.

C. Confirmation of Residual

1. After the chlorine solution applied by the continuous feed method has been retained in the pipeline for 24 hours, confirm that a chlorine residual of [10] [25] [50] [_____] mg/L minimum exists along the pipeline by sampling at air valves and other points of access[, such as tapping valves].
2. With the slug method, confirm by sampling as the slug passes each access point and as it leaves the pipeline that the chlorine concentration in the slug is at least 50 mg/L.

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D. Pipeline Flushing

After confirming the chlorine residual, flush the excess chlorine solution from the pipeline until the chlorine concentration in the water leaving the pipe is [within 0.5 mg/L of the replacement water] [no higher than that generally prevailing in the distribution system] [_____].

E. Bacteriologic Tests

Collect two sets of samples per AWWA C651, Section 5.1, deliver to a certified laboratory within six hours of obtaining the samples, and obtain a bacteriologic quality test to demonstrate the absence of coliform organisms in each separate section of the pipeline after chlorination and refilling. Collect at least one set of samples from each end of the pipeline.

F. Repetition of Procedure

If the initial chlorination fails to produce required residuals and bacteriologic tests, repeat the chlorination and retesting until satisfactory results are obtained.

G. Test Facility Removal

After satisfactory disinfection, disinfect and replace air valves, restore the pipe coating, and complete the pipeline where temporary disinfection or test facilities were installed.

H. Piping to be Disinfected

1. Disinfect all new potable water piping.
2. The Owner will provide potable water at no cost to the Contractor for the first disinfection effort. If bacteriological testing shows that the first disinfection effort was not successful, the Contractor will be charged the cost of additional water at the Owner's current rates.

END OF SECTION

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SECTION 400500 GENERAL PIPING REQUIREMENTS

PART 1 - GENERAL

A. Description

This section describes the general requirements for selecting bolts, nuts, miscellaneous piping items, and gaskets for flanges for the piping in this project.

B. Submittals

1. Submit shop drawings in accordance with the General Conditions and Section 013300.
2. Submit affidavit of compliance with referenced standards (e.g., AWWA, ANSI, ASTM, etc.).
3. Submit certified copies of mill test reports for bolts and nuts, including coatings if specified. Provide recertification by an independent domestic testing laboratory for materials originating outside of the United States.
4. Submit manufacturer's data sheet for gaskets supplied showing dimensions and bolting recommendations.

PART 2 - MATERIALS

A. Thread Forming for Stainless Steel Bolts

Form threads by means of rolling, not cutting or grinding.

B. T-Bolts, Nuts, and Connecting Hardware for Mechanical Joint Fittings for Ductile Iron Pipe

1. Hardware for buried mechanical joint fittings shall be Type 316 stainless steel or high strength low alloy steel material in accordance with AWWA C111.

C. Bolts and Nuts for Flanges for Ductile-Iron Piping

1. Bolts and nuts for buried Class 125 or 150 flanges shall be Type 316 stainless steel conforming to ASTM A193, Grade B8M for bolts and ASTM A194, Grade 8M for nuts.
2. Fit shall be Classes 2A and 2B per ASME B1.1 when connecting to cast-iron valves having body bolt holes.

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3. Bolts used in flange insulation kits shall conform to ASTM A193 (Grade B7). Nuts shall conform to ASTM A194 (Grade 2H).
4. Provide washers for each nut. Washers shall be of the same material as the nuts.

D. Lubricant for Stainless Steel Bolts and Nuts

Lubricant shall be chloride free and shall be RAMCO TG-50, Anti-Seize by RAMCO, Specialty Lubricants Corporation Husky™ Lube O'Seal, or equal.

E. Gaskets for Flanges for Ductile-Iron Piping and Fittings in Water Service

Gaskets shall be full face, 1/8-inch thick, cloth-inserted rubber, with a Shore "A" hardness of 75 to 85. Gaskets shall be suitable for a water pressure of 200 psi at a temperature of 180°F. Gaskets shall have "nominal" pipe size inside diameters not the inside diameters per ASME B16.21. Products: Garlock Style 19 or equal.

F. Threaded Caps for Protection of Nuts and Bolt Threads

Caps shall be high-density polyethylene, color [black] [orange] [gray]. The caps shall be filled with an anticorrosive lubricant to prevent nuts and bolts from rusting and corroding. [Lubricant shall be suitable for use in potable water.] Caps shall withstand temperatures from -40°F to 200°F. Caps shall be suitable to use in exposed, buried, and submerged service conditions. Products: Sap-Seal Products, Inc.; Advance Products and Systems, Inc., "Radolid"; or equal.

G. Moldable Filler Tape for Pipe Surface Transition Areas

1. Filler tape shall be a 100% solids mastic-like butyl-rubber filler designed to fill and smooth the transition areas between adjacent coating surfaces such as step-down weld areas, surface irregularities beneath heat-shrink sleeves, pipefittings, and exothermic welds for cathodic protection bonding wire connections. Characteristics:
 - a. Thickness per ASTM D1000: 1/8 inch minimum.
 - b. Peel adhesion to primed pipe: 300 ounces per inch minimum.
 - c. Elongation: 600% minimum.
2. Products: Tapecoat "Moldable Sealant," Polyken No. 939 Filler Tape, or equal.

H. Flange Insulation Kits

(To be determined)

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PART 3 - EXECUTION

A. Raised Face and Flat Face Flanges

Where a raised face flange connects to a flat-faced flange, remove the raised face of the flange.

B. Installing Flanged Piping

1. Set pipe with the flange bolt holes straddling the pipe horizontal and vertical centerline. Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Before bolting up, align flange faces to the design plane within 1/16 inch per foot measured across any diameter. Align flange bolt holes within 1/8-inch maximum offset.
2. Inspect each gasket to verify that it is the correct size, material, and type for the specified service and that it is clean and undamaged. Examine bolts or studs, nuts, and washers for defects such as burrs or cracks and rust and replace as needed.
3. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing, lubricate carbon steel bolts with oil and graphite, and tighten nuts uniformly and progressively.
4. Bolt lengths shall extend completely through their nuts. Any that fail to do so shall be considered acceptably engaged if the lack of complete engagement is not more than one thread.
5. Do not use more than one gasket between contact faces in assembling a flanged joint.
6. Tighten the bolts to the manufacturer's specifications, using the recommended cross bolt pattern in multiple steps of increasing torque, until the final torque requirements are achieved. Do not over torque.
7. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.
8. Install threaded nut and bolt thread protection caps after completing the bolt, nut, and gasket installation. Install on buried piping.

C. Installing Blind Flanges

1. At outlets not indicated to be connected to valves or to other pipes and to complete the installed pipeline hydrostatic test, provide blind flanges with bolts, nuts, and gaskets.

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2. Coat the inside face of blind flanges per Section 099761.

D. Installation of Stainless Steel Bolts and Nuts

Prior to assembly, coat threaded portions of stainless steel bolts and nuts with lubricant.

END OF SECTION

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SECTION 400515 PRESSURE TESTING OF PIPING

PART 1 - GENERAL

A. Description

This section specifies the hydrostatic and leakage testing of pressure piping for water transmission mains.

B. Related Work Specified Elsewhere in Specifications

1. Horizontal Directional Drilling: 330525
2. General Piping Requirements: 400500.
3. Valves: 400520
4. Ductile Iron Pipe and Fittings: 402040.
5. High Density Polyethylene (HDPE) Pipe: 402097

C. Submittals

1. Submit a pressure testing plan in accordance with the General Conditions and Specification Section 013300.
2. Submit test bulkhead locations and design calculations, pipe attachment details, and methods to prevent excessive pipe wall stresses.
3. Submit six copies of the test records to the District's Representative upon completion of the testing.
4. Submit testing records as specified below.

D. Testing Records

Provide records of each piping installation during the testing. These records shall include:

1. Date and times of test.
2. Identification of pipeline, or pipeline section tested or retested.
3. Identification of pipeline material.
4. Identification of pipe specification.

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5. Test fluid.
6. Test pressure at low point in pipeline or pipeline section.
7. Remarks: Leaks identified (type and location), types of repairs, or corrections made.
8. Certification by Contractor that the leakage rate measured conformed to the Specifications.

E. Measurement and Payment

See Specification Section 012000 – Measurement and Payment.

PART 2 - MATERIALS

A. Manual Air-Release Valves for Buried Piping

Provide temporary manual air-release valves at test bulkheads for pipeline test. Construct the pipe outlet in the same manner as for a permanent air valve and after use, seal with a blind flange, pipe cap, or plug and coat the same as the adjacent pipe.

B. Test Bulkheads

Design, fabricate, and provide test bulkheads where required for the purpose of executing the required pressure test(s). Materials shall comply with the minimum requirements for each respective pipe material. Design pressure shall be at least 2.0 times the specified test pressure for the section of pipe containing the bulkhead. Limit stresses to 70% of yield strength of the bulkhead material at the bulkhead design pressure. Include air-release and water drainage connections.

C. Testing Fluid

1. Testing fluid shall be potable water.
2. Submit request for use of water from the District's / City of Santa Maria's waterlines 48 hours in advance.
3. The Contractor may obtain the water from the District / City of Santa Maria at the respective agency's rate of charges.

D. Testing Equipment

Provide calibrated pressure gauges, pipes, bulkheads, pumps, chart recorder, and meters to perform the hydrostatic testing.

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PART 3 - EXECUTION

A. Testing Preparation

1. Pipes shall be in place, backfilled, and restrained/anchored before commencing pressure testing.
2. Pressure test piping prior to placing final asphalt surface course.
3. For buried piping, the pipe may be partially backfilled and the joints left exposed for inspection during an initial leakage test. Perform the actual pressure test, however, after completely backfilling and compacting the trench.
4. Provide any temporary piping needed to carry the test fluid to the piping that is to be tested. After the test has been completed and demonstrated to comply with the specifications, disconnect and remove temporary piping. Do not remove exposed vent and drain valves at the high and low points in the tested piping; remove any temporary buried valves and cap the associated outlets. Plug taps or connections to the existing piping from which the test fluid was obtained.
5. Provide temporary drain lines needed to carry testing fluid away from the pipe being tested. Remove such temporary drain lines after completing the pressure testing. Dewater the pipes after they have been tested.
6. Prior to starting the test, the Contractor shall notify the District's Representative.

B. Cleaning

1. Before conducting hydrostatic tests, flush pipes with water to remove dirt and debris. Maintain a flushing velocity of at least 3 fps for water testing. Flush pipes for time period as given by the formula

$$T = \frac{2L}{3}$$

in which:

T = flushing time (seconds)

L = pipe length (feet).

2. For pipelines 24 inches or larger in diameter, acceptable alternatives to flushing are use of high-pressure water jet, sweeping, or scrubbing. Water, sediment, dirt, and foreign material accumulated during this cleaning

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operation shall be discharged, vacuumed, or otherwise removed from the pipe.

C. Length of Test Section for Buried Piping

Test section shall be full alignment length as shown on the drawings.

D. Initial Pipeline Filling for Hydrostatic Testing

Maximum rate of filling shall not cause water velocity in pipeline to exceed 1 fps. Filling may be facilitated by removing automatic air valves and releasing air manually.

E. Hydrostatic Pressure Testing of Buried Ductile Iron Piping

1. Where any section of the piping contains concrete thrust blocks or encasement, do not make the pressure test until at least 10 days after the concrete has been placed. When testing mortar-lined piping, fill the pipe to be tested with water and allow it to soak for at least 48 hours to absorb water before conducting the pressure test.
2. Apply and maintain the test pressure by means of a positive displacement hydraulic force pump. Maintain the test pressure for the following duration by restoring it whenever it falls an amount of 5 psi:

Pipe Diameter (inches)	Hours
24	8

3. After the test pressure is reached, use a meter to measure the additional water added to maintain the pressure. This amount of water is the loss due to leakage in the piping system. The allowable leakage volume is defined by the formula

$$L = \frac{HND(P)^{1/2}}{C}$$

in which:

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- L = allowable leakage (gallons)
- H = specified test period (hours)
- N = number of rubber-gasketed joints in the pipe tested
- D = diameter of the pipe (inches)
- P = specified test pressure (psig)
- C = 7,400

4. Repair and retest any pipes showing leakage rates greater than that allowed in the above criteria.

F. Hydrostatic Field Leak Testing of HDPE Piping

1. Perform hydrostatic testing for leakage in accordance with ASTM F2164. The test period shall be as defined in ASTM F2164, Section 9.
2. Perform field leak test of assembled HDPE pipe prior to pullback into the HDD completed borehole. See Section 330525 – Horizontal Directional Drilling. Leakage is not permitted.
3. Examine exposed pipe or fittings carefully during the leak test for damage. Repair any damaged or defective pipe, fittings, valves, or hydrants discovered during the leak test and repeat the test. During the test period, add makeup water to keep the pressure constant.
4. Perform in-ground leak test of carrier pipe after installation into HDD completed borehole. See Section 330525 – Horizontal Directional Drilling. Leakage is not permitted.
5. The total time for initial pressurization and time at test pressure shall not exceed eight hours at 1.5 times the system pressure rating. If the test is not completed because of leakage, equipment failure, or any other reason within this total time, depressurize the test section and allow the pipe to “relax” for at least eight hours before starting the next testing sequence.
6. Allow the water, pipe, and soil to thermally stabilize. Fill the pipeline, vent the air, and allow the filled pipeline to sit overnight (in above freezing weather) to thermally stabilize.

G. Repetition of Test

If the actual leakage exceeds the allowable, locate and correct the faulty work and repeat the test. Restore the work and all damage resulting from the leak and its repair. Eliminate visible leakage.

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H. Bulkhead and Test Facility Removal

After a satisfactory test, remove the testing fluid, remove test bulkheads and other test facilities, and restore the pipe coatings.

I. Test Pressure and Test Fluids

1. Above ground testing pressures for HDPE carrier pipe shall be as listed below:

a. (to be determined)

2. In-ground testing and design pressures shall be as listed below:

Pipe Service	Pipe Material	Testing Fluid	Design Working Pressure (psi)	Test Pressure (psi)
Potable Water	DIP	Potable Water	110 PSI (@ RIVER)	180 PSI (@ RIVER)
Potable Water	HDPE	Potable Water	150 PSI (@ LOW POINT)	220 PSI (@ LOW POINT)
Potable Water	DIP	Potable Water	60 PSI (@ Mesa)	130 PSI (@ Mesa)

END OF SECTION

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SECTION 402040 DUCTILE-IRON PIPE

PART 1 - GENERAL

A. Description

This section describes materials, testing, and installation of ductile-iron pipe and fittings for potable water transmission.

B. Related Work Specified Elsewhere

1. Cold-Applied Wax Tape Coating: 099752.
2. Polyethylene Sheet Encasement: 099754.
3. Fusion-Bonded Epoxy Linings and Coatings: 099761.
4. Trenching, Backfilling, and Compacting: 312316.
5. General Pressurized Piping Requirements: 400500.
6. Pressure Testing of Piping: 400515.

C. Submittals

1. Submit shop drawings in accordance with the General Conditions and Section 013300.
2. Provide an affidavit of compliance with standards referenced in this specification, e.g., AWWA C151. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of AWWA C153 fittings that are being used in the project. The pressure test shall demonstrate that the minimum safety factor described in AWWA C153, Section 5.5 is met.
3. Provide the following information:
 - a. Mortar lining thickness.
 - b. Wall thickness.
 - c. Material test data for this project.
 - d. Show deflections at push-on and mechanical joints.
 - e. Submit joint and fitting details and manufacturer's data sheets.

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4. Submit calculations and test data proving that the proposed restrained joint arrangement can transmit the required forces with a minimum safety factor of 1.5.
5. Submit certificate that cement for mortar lining complies with ASTM C 150, designating type.
6. Submit test report on physical properties of rubber compound used in the gaskets.
7. Submit copies of delivery slips for all materials specified in this section.

D. Measurement and Payment

1. See Specification Section 012000 – Measurement and Payment.

PART 2 - MATERIALS

A. Pipe

Pipe shall be cast ductile (nodular) iron, conforming to AWWA C151. Provide pipe in nominal 18- or 20-foot laying lengths.

B. Wall Thickness/Pressure Class

1. Minimum wall thickness for pipe having push-on joints, mechanical joints, restrained joints, or plain ends shall be Pressure Class 250.
2. Push-on, mechanical joint, restrained joint, and flanged fittings 24 inches and smaller shall conform to AWWA C110 with a minimum pressure rating of 250 psi.
3. Minimum pipe wall thickness required for tapped outlets shall be in accordance with Table A.1 of AWWA C151 for four full threads. Reducing tee fittings are required for outlets larger than 2 inches nominal.

C. Pipe Marking

Plainly mark each length of straight pipe and each fitting at the bell end to identify the design pressure class, the ductile-iron wall thickness, and the date of manufacture. Mark the spigot end of restrained joint pipe to show clearly the required depth of insertion into the bell.

D. Design Criteria

1. Obtain the following information from the drawings:
 - a. Elevation of the pipe centerline and of the completed ground.

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- b. Alignment of the pipeline.
- c. Nominal pipe size.
- d. Design internal pressure class.
- e. Joint types(s).

E. Fittings

- 1. Push-on, mechanical joint, restrained joint, and flanged fittings 24 inches and smaller shall conform to AWWA C110 with a minimum pressure rating of 250 psi. Material shall be ductile iron.

F. Flanges

- 1. Flanges shall be solid back, Class 125 per AWWA C115 with a pressure rating of 250 psi. Material shall be ductile iron.
- 2. Flanges shall be flat faced.

G. Pipe Lining--Cement Mortar

- 1. Line pipe interior and fittings with cement-mortar per AWWA C104. Lining thickness shall be the double thickness listed in AWWA C104, Section 4.7. Cement for lining material shall conform to ASTM C 150, Type II, for water service.
- 2. Maintain a moist environment inside the lined pipe and fittings by sealing the ends with polyethylene sheet.
- 3. Loose areas of cement-mortar lining are not acceptable. Remove and reconstruct lining in areas where quality is defective, such as sand pockets, voids over sanded areas, blisters, drummy areas, cracked areas, and thin spots. Longitudinal cracks in excess of 1/32 inch in width or where crack extends to metal shall be repaired with epoxy. Repair all cracks larger than 1/16 inch with epoxy.

H. Gaskets for Mechanical, Push-On, and Restrained Joints

Synthetic or natural rubber in accordance with AWWA C111.

I. Gaskets for Flanges

See Section 400500.

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J. Joints

1. Joints in buried piping shall be of the restrained push-on or restrained mechanical-joint type per AWWA C111 except where flanged joints are required to connect to valves or other equipment. Provide restrained buried joints to the limits shown in the drawings.
2. Restrained joints for piping shall be rated at 350 psi working pressure.
3. Restrained joints for piping shall be American Cast Iron Pipe "Lok-Ring" or "Flex-Ring," U.S. Pipe "TR-Flex," or equal. All weldments for restrained joints shall be tested by the liquid penetrant method per ASTM E 165. Restrained joints for field closures shall be "mega-lug" by EBAA Iron (See Paragraph K below)
4. Where thrust restraint is called for in the drawings, provide pipe with restrained joints capable of transmitting 1.5 times the thrust, as calculated by the following equation:

$$T = 1.5 * (0.785 * P * D^2)$$

where:

- P = Pressure class of pipe in psi.
- D = Outside diameter of pipe in inches.
- T = Thrust in pounds.

K. Mechanical Joint Restraint System Using Follower Ring and Wedges

The restraining mechanism shall consist of a follower gland having a seal gasket and individually actuated wedges that increase their resistance to pullout as pressure or external forces increase. The system manufacturer shall provide all the components (follower ring, wedges, and gaskets) for the restraining device. The device shall be capable of full mechanical joint deflection during assembly, and the flexibility of the joint shall be maintained after burial. The joint restraint ring and its wedging components shall be constructed of ductile iron conforming to ASTM A 536, Grade 60-42-10. The wedges shall be ductile iron, heat-treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with mechanical joint bells conforming to AWWA C111 and AWWA C153. The design shall use torque limiting twist-off nuts to provide actuation of the restraining wedges. Minimum rated pressure shall be 250 psi. Products: Megalug Series 1100 as manufactured by EBAA Iron, Inc., or equal.

L. Ductile-Iron Pipe Weldments

1. All welding to ductile-iron pipe, such as for bosses, joint restraint, and joint bond cables, shall be done at the place of manufacture of the pipe. Perform welding by skilled welders experienced in the method and materials to be

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used. Welders shall be qualified under the standard qualification procedures of the ASME Boiler and Pressure Vessel Code, Section IX, Welding Qualifications.

2. Welds shall be of uniform composition, neat, smooth, full strength, and ductile. Completely grind out porosity and cracks, trapped welding flux, and other defects in the welds in such a manner that will permit proper and complete repair by welding.
3. Completed welds shall be inspected at the place of manufacture by the liquid penetrant method. Conform to the requirements specified in ASTM E 165, Method A, Type I or Type II. The materials used shall be water washable and nonflammable.

PART 3 - EXECUTION

A. Delivery, Unloading, and Temporary Storage of Pipe at Site

1. Limit onsite pipe storage to a maximum of one week.
2. Use unloading and installation procedures that avoid cracking of the lining. If necessary, use plastic sheet bulkheads to close pipe ends and keep cement-mortar lining moist.
3. Deliver the pipe alongside the pipelaying access road over which the pipe trailer-tractors can travel under their own power. Place the pipe in the order in which it is to be installed and secure it from rolling.
4. Do not move pipe by inserting any devices or pieces of equipment into the pipe barrel. Field repair linings damaged by unloading or installation procedures.

B. Sanitation of Pipe Interior

1. During laying operations, do not place tools, clothing, or other materials in the pipe.
2. When pipelaying is not in progress, close the ends of the installed pipe by a child- and vermin-proof plug.

C. Installing Flanged Fittings

1. Install in accordance with Section 400500. Cut the bore of the gaskets such that the gaskets do not protrude into the pipe when the flange bolts are tightened.

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D. Installing Buried Piping

1. Install in accordance with AWWA C600, Section 312316 and as follows.
2. When installing piping in trenches, do not deviate from line or grade. Measure for grade at the pipe invert.
3. Assemble restrained joints per manufacturer's instructions.

E. Joint Deflections for Buried Pipe

1. For restrained joints, do not exceed 80% of the manufacturer's recommended maximum deflections.
2. Small angular changes (less than 5 degrees) in vertical alignment may be accomplished by the use of pulled joints. For larger vertical deflections, place an elbow at the station and elevation of the vertical PI shown in the drawings. Provide thrust restraint as required in the drawings.
3. Assemble joints in accordance with AWWA C600 and the manufacturer's recommendations.

F. Coating and Polyethylene Encasement of Buried Pipe and Fittings

1. Provide asphaltic coating on buried pipe and fittings per AWWA C151.
2. Coat buried mechanical and restrained joint glands, bolts, nuts, and connecting hardware with wax tape per Section 099752.
3. Wrap buried pipe, fittings, valves, and joints with polyethylene sheet per Section 099754.

G. Buried Warning and Identification Tape

Provide magnetically detectable warning tape over pipe in trench. Magnetically detectable warning tape shall be 6-inch wide with blue protective polyethylene jacket resistant to alkalis, acids, and other destructive elements. The polyethylene tape shall be continuously imprinted with "CAUTION-BURIED WATER PIPING BELOW"

H. Hydrostatic Pressure Testing

Test pressures are shown in Section 400515. Test in accordance with Section 400515.

END OF SECTION

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SECTION 402097 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

PART 1 - GENERAL

A. Description

This section includes materials and testing of AWWA C906-07 high-density polyethylene pipe and fittings, with Standard PE Code Designation of PE-3408 and a hydrostatic design basis of 1,600 psi, for use in horizontal directional drilled piping. Maximum operating temperature is 74°F. Pipe diameter basis is IPS, with a standard dimension ratio (DR) and pressure class as shown in the drawings and specified below.

B. Related Work Specified Elsewhere

1. Trenching, Backfilling, and Compacting: 312316.
2. Horizontal Directional Drilling: 330525.
3. Installation of Carrier Pipe into HDD Completed Borehole: 330526.
4. Disinfection of Piping: 331300.
5. General Piping Requirements: 400500.
6. Valves: 400520.
7. Pressure Testing of Piping: 400515.

C. Submittals

1. Submit shop drawings in accordance with the General Conditions and Section 013300.
2. Submit materials list for review. Submit manufacturer's recommended method of installing pipe into HDD completed boreholes and steel surface conductor casings including methods for butt-fusing joints.
3. The polyethylene pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. Certification shall include a stress life curve per ASTM D2837.
4. Provide certification that the material is listed by the Plastics Pipe Institute in PPI TR-4 with a 73°F hydrostatic design stress rating of 800 psi and a 140°F hydrostatic design stress rating of 400 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D2837 and PPI

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TR-3 testing and validation of samples of the pipe manufacturer's production pipe.

5. The manufacturer's certification shall state that the pipe was manufactured from one specific resin in compliance with these specifications. The certificate shall state the specific resin used, its source, and list its compliance to these specifications.
6. Submit certified lab data to verify specified physical properties. Certify that tests are representative of pipe supplied for this project.
7. Submit affidavit of compliance with referenced standards (e.g., AWWA C901, C906, ASTM F714, etc.).
8. Submit recommended locations of flanged joints, unions, shop-fabricated fittings, and connections to other pipe materials. Submit detailed drawings of fittings.
9. Submit installation schedule.
10. Submit qualification certificates for operators of heat fusion equipment.
11. Submit schedule for placement of and removal of test bulkheads.

D. Measurement and Payment

See Specification Section 012000 – Measurement and Payment.

PART 2 - MATERIALS

A. Pipe

1. HDPE Pipe and fittings shall conform to AWWA C906 and the following requirements.
2. The minimum wall thickness (inches) for HDPE shall be in accordance with Table 4 of AWWA C906, for a DR of 9.0. Pressure Class/Maximum Working Pressure Rating shall be 200 psi in accordance with Table 9 of AWWA C906.
3. Pipe shall have a nominal IPS outside diameter of 30.0-inches. For the specified DR, the resulting average inside diameter is 22.933-inches.
4. The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index, and other physical properties throughout.

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5. Pipe shall have a minimum hydrostatic design basis (HDB) of 1,600 psi, as determined in accordance with ASTM D2837.
6. Pipe Material:
 - a. Materials used for the manufacture of polyethylene pipe and fittings shall be very high molecular weight, high-density ethylene/hexene copolymer PE 3408 polyethylene resin meeting the physical property and pipe performance requirements listed below.

Property	Specification	Units	Minimum Values
Material Designation	PPI/ASTM	---	PE3408
Material Classification	ASTM D1248	---	III C 5 P34
Cell Classification	ASTM D3350	---	345434C
Hardness	ASTM D2240	Shore "D"	64
Compressive Strength (Yield)	ASTM D695	psi	1,600
Tensile Strength @ Yield (Type IV Spec.)	ASTM D638 (2"/min)	psi	3,200
Elongation @ Yield	ASTM D638	%, min.	8
Tensile Strength @ Break (Type IV Spec.)	ASTM D638	psi	3,500 psi
Elongation @ Break	ASTM D638	%, min.	600
Modulus of Elasticity	ASTM D638	psi	110,000
ESCR:			
(Cond A,B,C: Mold. Slab)	ASTM D1693	Fo, Hrs	Fo>5,000
(Compressed Ring [Pipe])	ASTM F1248	F50, Hrs	F50>1,000
Slow Crack Growth	Battelle Method	Days to Failure	Fo>32
Impact Strength (IZOD) (0.125-Inch Thick)	ASTM D256 (Method A)	in-lb/in Notch	42
Linear Thermal Expansion Coefficient	ASTM D696	in/in/°F	1.2 x 10-4
Thermal Conductivity	ASTM C177	BTU, in/Ft2/hrs/°F	2.7
Brittleness Temp.	ASTM D746	°F	<-180°F
Vicat Soft. Temp.	ASTM D1525	°F	257
NSF Listing	Standard 14	---	"Listed"
*Standard deviation 0.01.			

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- b. The pipe shall be extruded from precompounded resin. In-plant blending of resin is unacceptable.

B. Nipples and Flanged Stub Ends

Short nipples and stub ends shall be of the same material as the pipe.

C. Fittings

Minimum radius of fabricated elbows shall be 2.5 diameters. The fittings shall be fully pressure rated by the manufacturer to provide a working pressure equal to the pipe for 50 years of service at 73°F with an included 2:1 safety factor. Manufacture the fittings from the same resin type, grade, and cell classification as the pipe. Fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects. The fittings shall be as uniform as practicable in color, opacity, density and other physical properties. The minimum "quick-burst" strength of the fittings shall not be less than that of the pipe with which the fitting is to be used.

D. Electrofusion Couplings and Joint Restraints

Electrofusion couplings and joint restraints shall be of the same material and meet the same minimum requirements as the pipe.

1. Electrofusion Couplings: ()
2. Electrofusion Joint restraints: ()

E. Joints

1. Join sections of polyethylene pipe into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method performed in accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer requirements of 500°F, alignment, and 150-psi interfacial fusion pressure.
2. Butt fusion joining shall result in a joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used. Extrusion welding or hot gas welding of HDPE shall not be used. Flanges, unions, grooved-couplers, transition fittings, and some mechanical couplers may be used to connect HDPE pipe mechanically without butt fusion where shown in the drawings and at elbows and tees.

F. Flanges

Flanges shall be steel, conforming to the dimensions of ASME B16.5, Class 150 and the details in the drawings.

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G. Bolts, Nuts, and Gaskets for Flanges

See Section 400500.

H. Lubricant for Stainless Steel Bolts and Nuts

See Section 400500.

I. Trench Bedding and Backfill Materials

See Section 312316.

PART 3 - EXECUTION

A. Shipping, Storage, and Handling

1. Limit onsite pipe storage to a maximum of one week.
2. Transport pipe to the jobsite on padded bunks with nylon tie-down straps or padded bonding to protect the pipe. Protect the pipe from sharp objects. Anchor pipe securely to prevent slippage.
3. When the pipe is received, visually inspect to verify that the correct product was received. Check for damage that may have occurred during transit. Examine for fractures, kinking, deep gouges, or cuts. Remove pipe with gouges or cuts in excess of 10% of the pipe wall thickness.
4. Cover pipe 100% with protective coverings or tarpaulins to prevent deposition of road salts, diesel smoke, fuel residue, and other contaminants in transit.
5. Hook lifting equipment, such as cranes, extension boom cranes, and side boom tractors, to wide web choker slings that are secured around the load or to lifting lugs on the component. Use only wide web slings. Do not use wire rope slings and chains which can damage components. Use spreader bars when lifting pipe or components longer than 20 feet.
6. Unload large fabrications using a wide web choker sling and lifting equipment such as an extension boom crane, crane, or lifting boom. Do not use stub outs, outlets, or fittings as lifting points, and avoid placing slings where they will bear against outlets or fittings.
7. Protect the pipe from stones and sharp objects.

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B. Handling Pipe During Installation

1. Lift pipes with handling beams or wide belt slings near the middle of joints as recommended by the pipe manufacturer. Do not use cable slings, chains, or hooks.
2. Before installation, check pipe and fittings for cuts or scratches exceeding 10% of the pipe wall thickness, gouges, buckling, kinking, or splitting. Remove such defective pipe.

C. Sanitation of Pipe Interior

1. During fusion operations and laying operations, do not place tools, clothing, or other materials in the pipe.
2. When pipelaying is not in progress, including the noon hour, close the ends of the pipe by a vermin- and child-proof plug.

D. Qualification of Fusion Operators

Each operator performing fusion joining shall be qualified in the use of the manufacturer's recommended fusion procedure(s) by the following:

1. Appropriate training or experience in the use of the fusion procedure.
2. Making a sample joint according to the procedure that passes the following inspections and tests:
 - a. The joint shall be visually examined during and after joining and found to have the same appearance as a photograph or sample of an acceptable joint that was joined in accordance with the procedure; and
 - b. Test or examine the joint by one of the following methods:
 - (1) Pressure and tensile test as described in 49 CFR 192.283;
 - (2) Ultrasonic inspection and found to be free of flaws that would cause failure; or
 - (3) Cut into at least three longitudinal straps, each of which is:
 - (a) Visually examined and found to be free of voids or unbonded areas on the cut surface of the joint, and
 - (b) Deformed by bending, torque, or impact and if failure occurs, it must not initiate in the joint area.
 - c. Each operator shall be requalified under the procedure, if, during any 12-month period he:

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- (1) Does not make any joints under the procedure; or
- (2) Has three joints or three percent of the joints he has made, whichever is greater, that are found unacceptable by testing under 49 CFR 192.513.

E. Heat Fusion for Butt Joints

1. Comply with ASTM F2620, except as modified below.
2. Use fusion equipment specially designed for heat fusion of HDPE such as offered by McElroy Manufacturing, Inc., Tulsa, Oklahoma or equal. The equipment utilized shall be regulated for the different melt strength materials. Compatibility fusion techniques shall be used when polyethylenes of different melt indexes are fused together.
3. Maintain the proper temperature of the heater plate as recommended by the pipe manufacturer. Check it with a tempilstik or pyrometer for correct surface temperature.
4. Clean pipe ends inside and outside with a clean cotton cloth to remove dirt, water, grease, and other foreign materials.
5. Square (face) the pipe ends using facing tool of the fusion machine. Remove burrs, chips, and filings before joining pipe or fittings.
6. Check line-up of pipe ends in fusion machine to see that pipe ends meet squarely and completely over the entire surface to be fused. Make sure the clamps are tight so that the pipe does not slip during the fusion process.
7. Insert clean heater plate between aligned ends and bring ends firmly in contact with plate but do not apply pressure while achieving melt pattern. Allow pipe ends to heat and soften. Approximate softening depths are as follows:

Pipe Size (inches, IPS O.D.)	Approximate Melt Bead (inches)
30	x/x to x/x

8. Carefully move the pipe ends away from the heater plate and remove the plate (if the softened material sticks to the heater plate, discontinue the joint, clean heater plate, resquare pipe ends, and start over).
9. Bring melted ends together rapidly. Do not slam. Apply enough pressure to form a double roll-back bead to the body of the pipe around the entire circumference of the pipe about x/x to x/x-inch wide. Pressure is necessary to cause the heated material to flow together.

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10. Allow the joint to cool and solidify properly. Remove the pipe from the clamps and inspect the joint appearance.

F. Electrofusion

1. To be Completed

G. Placement of Pipe in Trench

This project will require trench installation of short segments of HDPE pipe to transition from the horizontally directionally drilled HDPE pipe as shown on the drawings. Placement of HDPE pipe in trench shall conform to the following requirements.

1. Control water in trench per Section 312316.
2. Install in accordance with ASTM F1668, except as modified herein.
3. Excavate to a minimum of 6 inches below the subgrade. Complete excavation to a uniform foundation free of protruding rocks. Complete stabilization of foundation, per Section 312316, then place material specified for the bedding in Section 312316 to bring the trench bottom to grade. Place and compact the bedding as detailed in the drawings. Trench bottom shall be continuous, smooth, and free from rocks.
4. Cut a depression to permit removal of the pipe handling slings. After the pipe has been butt-fused and the joints have set, snake the pipe into the trench per the pipe manufacturer's recommendations in order to allow for thermal expansion and contraction of the pipe.
5. Lower the fused pipe onto the bedding and install it to line and grade along its full length on firm bearing except at the sling depressions. Do not handle pipe at fabricated fittings. Tolerances on grade are 1/4 inch.
6. Consider pull-out forces caused by circumferential as well as longitudinal thermal contraction when flanged and mechanical joints are used. Make provisions for sealing as well as restraining to compensate for the axial loading due to expansion or contraction and/or pipe settlement.
7. When the pipe is laid in a rock cut or stony soil, excavate the trench at least 6 inches below pipe bottom grade and bring back to grade with compacted bedding. Remove boulders and large stones to avoid point contacts and to provide a uniform bed for the pipe.
8. Place a minimum 6-inch-thick layer of bedding material in the trench. Compact base to 90% relative compaction.

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9. Backfill pipe zone immediately after pipe has been bedded and joined. Prevent movement of pipe while backfilling. Carefully place the material around the pipe so that the pipe barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe or in between stiffening ribs. Backfill material placed under the haunches shall be shovel sliced. Use particular care in placing material on the underside of the pipe to prevent lateral movement during subsequent backfilling. Limit unbackfilled, installed pipe to five sections maximum. Avoid extended exposure to sun.
10. Add bedding and backfill material up to the top of the pipe in lifts not exceeding 6 inches at a time. Compact each lift to 90% relative compaction by mechanical or hand tamping. Do not use water flooding or jetting. Do not allow any void spaces beneath or around the pipe.
11. Add a 12-inch layer of bedding and backfill material above the top of the pipe in two 6-inch lifts. Compact each lift to 95% relative compaction.
12. Fill the remainder of the trench in maximum lifts of [12] [_____] inches. Compact each layer to [90%] [_____%] relative compaction. Material shall be [native soil] [_____] as specified in Section 312316.
13. Compact by means of vibratory equipment or by hand tamping. Do not add successive layers unless the previous layer is compacted to the specified relative compaction. Compact material placed within 12 inches of the outer surface of the pipe by hand tamping only.
14. Provide sufficient space along each side of the pipe and the trench wall to observe that the embedment material fills all spaces below pipe spring line under the pipe haunches. Do not allow pipe to float out of position.

H. Cold-Bending of Curved Segments

DR-9 HDPE pipe may be cold-bent to a minimum radius of no less than 40 times the pipe outside diameter (O.D.) as it is installed along a curved alignment. If a rigid fitting or flange is present along the curved alignment, DR-9 HDPE pipe may be cold-bent to a minimum radius of no less than 100 times the pipe O.D. The minimum bending radius that can be applied to the pipe without kinking it varies with the diameter and wall thickness of the pipe and shall not exceed the recommendations of the manufacturer. If adequate space is not available for the required radius, fuse a fitting of the required angle into the piping system to obtain the necessary change in direction.

I. Static Electricity Discharging

1. Static electricity charges are generated on polyethylene pipe by friction, particularly during the handling of pipe in storage, shipping, and installation. The flow of air or gas containing dust or scale will also build up significant static charges, as will the flow of dry materials through the pipe. These

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charges are a safety hazard, particularly in areas where there is leaking gas or an explosive atmosphere.

2. Plastic pipe is a nonconductor of electricity and the static charge will remain in place until some grounding device comes close enough to allow it to discharge.
3. The discharge of these static electric charges is the responsibility of the Contractor.

J. Operations Incidental to Joint Completion

1. Install metallic tracer wire or magnetically detectable warning tape where detailed in the drawings.
2. Plan joint completion to accommodate temporary test bulkheads for hydrostatic testing.

K. Flanged Connections

1. Accomplish mechanical joining to other piping materials (fittings, valves, etc.) with factory-made flange adapters and steel or ductile-iron backup flanges. Use flanges to connect lengths of HDPE together when heat fusion is impractical.
2. Flange adapters shall be pressure rated the same as the pipe. Flange adapters shall be heat fused to the pipe as outlined in the heat fusion section.
3. Use gaskets between the polyethylene flange adapters when recommended by the HDPE pipe manufacturer. Apply sufficient torque evenly to the bolts to prevent leaks. After initial installation and tightening of flanged connections, allow the connections to set for a few hours. Then conduct a final tightening of the bolts.
4. Lubricate nuts and bolts with oil or graphite prior to installation.
5. Wrap buried flanges, bolts, and metal with the sheet polyethylene film or tape specified for the valves and equipment. Extend the wrap or tape over the flanges and bolts and secure it around the adjacent pipe circumference with tape.
6. Check operation of valves connected to molded stub end flange adapters. Insert polyethylene spacer if recommended by pipe manufacturer for clearance.

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L. Placement of Pipe in Casings

1. Fuse each section of pipe prior to insertion in casing. Do not injure pipe by dragging or sliding on concrete or asphalt. Use pipeline casing insulators or dollies to move pipe through casing.
2. Do not encroach on specified minimum annular space between pipe and casing excavation. Do not obstruct between pipe and casing to permit annular backfill to fill all spaces.
3. Brace pipe during the placing of annular backfill where casing is detailed as backfilled in the drawings. Do not fuse braces to pipe. Limit diameter variations to 1% of the nominal diameter.

M. Hydrostatic Testing

1. See Section 400515 – Pressure Testing of Piping.

END OF SECTION

APPENDIX A
PERMITS

*IN PROGRESSS
TO BE SUBMITTED WITH 90% CONTRACT DOCUMENTS*

APPENDIX B
GEOTECHNICAL BASELINE REPORT

IN PROGRESS
TO BE SUBMITTED WITH 90% CONTRACT DOCUMENTS

APPENDIX C
EASEMENTS

IN PROGRESS
TO BE SUBMITTED WITH 90% CONTRACT DOCUMENTS

APPENDIX D
SURVEY CONTROL

PLANS