

City of San Diego

CONTRACTOR'S NAME: TC Construction Company, Inc.

ADDRESS: 10540 Prospect Ave., Santee, CA 92071

TELEPHONE NO.: 619-448-4560

FAX NO.: 619-448-3341

CITY CONTACT: Brittany Friedenreich, Contract Specialist, Email: BFriedenreic@sanidiego.gov

Phone No. (619) 533-3104, Fax No. (619) 533-3633

M.Kargar / H.McLintock / Lad

BIDDING DOCUMENTS



FOR

MID CITY PIPELINE PHASE 2A

BID NO.:	K-18-1545-DBB-3
SAP NO. (WBS/IO/CC):	B-17081
CLIENT DEPARTMENT:	2013
COUNCIL DISTRICT:	7, 9
PROJECT TYPE:	KA

THIS CONTRACT WILL BE SUBJECT TO THE FOLLOWING:

- PHASED-FUNDING
- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM
- PREVAILING WAGE RATES: STATE FEDERAL
- APPRENTICESHIP

BID DUE DATE:

2:00 PM

DECEMBER 6, 2017

CITY OF SAN DIEGO

PUBLIC WORKS CONTRACTS

1010 SECOND AVENUE, 14th FLOOR, MS 614C

SAN DIEGO, CA 92101

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ENGINEER OF WORK

The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineer:

Michael Anthony Colletti
1) Registered Engineer

10-16-17
Date

Seal:



Brian Warner Vitelle
2) For City Engineer

10/19/17
Date

Seal



NOTICE INVITING BIDS

1. **SUMMARY OF WORK:** This is the City of San Diego's (City) solicitation process to acquire Construction services for **Mid City Pipeline Phase 2A**. For additional information refer to Attachment A.
2. **FULL AND OPEN COMPETITION:** This contract is open to full competition and may be bid on by Contractors who are on the City's current Prequalified Contractors' List. For information regarding the Contractors Prequalified list visit the City's web site: <http://www.sandiego.gov>.
3. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **\$4,000,000**.
4. **BID DUE DATE AND TIME ARE: DECEMBER 6, 2017, at 2:00PM.**
5. **PREVAILING WAGE RATES APPLY TO THIS CONTRACT:** Refer to Attachment D.
6. **LICENSE REQUIREMENT:** The City has determined that the following licensing classification is required for this contract: **A**
7. **SUBCONTRACTING PARTICIPATION PERCENTAGES:** Subcontracting participation percentages apply to this contract.
 - 7.1. The City has incorporated **mandatory** SLBE-ELBE subcontractor participation percentages to enhance competition and maximize subcontracting opportunities. For the purpose of achieving the mandatory subcontractor participation percentages, a recommended breakdown of the SLBE and ELBE subcontractor participation percentages based upon certified SLBE and ELBE firms has also been provided to achieve the mandatory subcontractor participation percentages:

1.	SLBE participation	7.8%
2.	ELBE participation	14.5%
3.	Total mandatory participation	22.3%
 - 7.2. The Bid may be declared non-responsive if the Bidder fails to meet the following requirements:
 - 7.2.1. Include SLBE-ELBE certified subcontractors at the overall mandatory participation percentage identified in this document; **OR**
 - 7.2.2. Submit Good Faith Effort documentation, saved in searchable Portable Document Format (PDF) and stored on Compact Disc (CD) or Digital Video Disc (DVD), demonstrating the Bidder made a good faith effort to outreach to and include SLBE-ELBE Subcontractors required in this document within 3 Working Days of the Bid opening if the overall mandatory participation percentage is not met.

8. PRE-BID MEETING:

8.1. Prospective Bidders are **encouraged** to attend the Pre-Bid Meeting. The purpose of the meeting is to discuss the scope of the Project, submittal requirements, the pre-qualification process and any Equal Opportunity Contracting Program requirements and reporting procedures. To request a sign language or oral interpreter for this visit, call the Public Works Contracts Division at (619) 533-3450 at least 5 Working Days prior to the meeting to ensure availability. The Pre-Bid meeting is scheduled as follows:

Date: November 16 ,2017
Time: At 10:00 AM
Location: 1010 Second Avenues, Suite 1400, San Diego, CA 92101

Attendance at the Pre-Submittal Meeting will be evidenced by the Bidder's representative's signature on the attendance roster. It is the responsibility of the Bidder's representative to complete and sign the attendance roster.

9. AWARD PROCESS:

9.1. The Award of this contract is contingent upon the Contractor's compliance with all conditions of Award as stated within these documents and within the Notice of Intent to Award.

9.2. Upon acceptance of a Bid, the City will prepare contract documents for execution within approximately 21 days of the date of the Bid opening. The City will then award the Contract within approximately 14 days of receipt of properly signed Contract, bonds, and insurance documents.

9.3. This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form the City Attorney's Office.

9.4. The low Bid will be determined by Base Bid alone.

9.5. Once the low bid has been determined, the City may, at its sole discretion, award the contract for the Base bid alone; or for the Base bid plus one or more alternates.

10. SUBMISSION OF QUESTIONS:

10.1. The Director (or Designee) of Public Works Department is responsible for opening, examining, and evaluating the competitive Bids submitted to the City for the acquisition, construction and completion of any public improvement except when otherwise set forth in these documents. Any questions related to this solicitation shall be submitted to:

Public Works Contracts
1010 Second Avenue, 14th Floor
San Diego, California, 92101
Attention: Brittany Friedenreich, Contract Specialist

OR:

BFriedenreic@sandiego.gov

- 10.2.** Questions received less than 14 days prior to the date for opening of Bids may not be considered.
 - 10.3.** Questions or clarifications deemed by the City to be material shall be answered via issuance of an addendum and posted to the City's online bidding service.
 - 10.4.** Only questions answered by formal written addenda shall be binding. Oral and other interpretations or clarifications shall be without legal effect. It is the Bidder's responsibility to be informed of any addenda that have been issued and to include all such information in its Bid.
- 11. PHASED FUNDING:** For Phased Funding Conditions, see Attachment B.

INSTRUCTIONS TO BIDDERS

1. PREQUALIFICATION OF CONTRACTORS:

- 1.1. Contractors submitting a Bid must be pre-qualified for the total amount proposed, including all alternate items, prior to the date of submittal. Bids from contractors who have not been pre-qualified as applicable and Bids that exceed the maximum dollar amount at which contractors are pre-qualified may be deemed **non-responsive** and ineligible for award. Complete information and links to the on-line prequalification application are available at:

<http://www.sandiego.gov/cip/bidopps/prequalification.shtml>

- 1.2. The completed application must be submitted online no later than 2 weeks prior to the bid opening. For additional information or the answer to questions about the prequalification program, contact David Stucky at 619-533-3474 or dstucky@sandiego.gov.

- 1.3. Due to the City's responsibility to protect the confidentiality of the contractors' information, City staff will not be able to provide information regarding contractors' prequalification status over the telephone. Contractors may access real-time information about their prequalification status via their vendor profile on [PlanetBids™](#).

2. **ELECTRONIC FORMAT RECEIPT AND OPENING OF BIDS:** Bids will be received in electronic format (eBids) EXCLUSIVELY at the City of San Diego's electronic bidding (eBidding) site, at: <http://www.sandiego.gov/cip/bidopps/index.shtml> and are due by the date, and time shown on the cover of this solicitation.

- 2.1. **BIDDERS MUST BE PRE-REGISTERED** with the City's bidding system and possess a system-assigned Digital ID in order to submit an electronic bid.

- 2.2. The City's bidding system will automatically track information submitted to the site including IP addresses, browsers being used and the URLs from which information was submitted. In addition, the City's bidding system will keep a history of every login instance including the time of login, and other information about the user's computer configuration such as the operating system, browser type, version, and more. Because of these security features, Contractors who disable their browsers' cookies will not be able to log in and use the City's bidding system.

- 2.3. The City's electronic bidding system is responsible for bid tabulations. Upon the bidder's or proposer's entry of their bid, the system will ensure that all required fields are entered. **The system will not accept a bid for which any required information is missing.** This includes all necessary pricing, subcontractor listing(s) and any other essential documentation and supporting materials and

forms requested or contained in these solicitation documents.

- 2.4. BIDS REMAIN SEALED UNTIL BID DEADLINE.** eBids are transmitted into the City's bidding system via hypertext transfer protocol secure (https) mechanism using SSL 128-256 bit security certificates issued from Verisign/Thawte which encrypts data being transferred from client to server. Bids submitted prior to the "Bid Due Date and Time" are not available for review by anyone other than the submitter which has until the "Bid Due Date and Time" to change, rescind or retrieve its proposal should it desire to do so.
- 2.5. BIDS MUST BE SUBMITTED BY BID DUE DATE AND TIME.** Once the bid deadline is reached, no further submissions are accepted into the system. Once the Bid Due Date and Time has lapsed, bidders, proposers, the general public, and City staff are able to immediately see the results on line. City staff may then begin reviewing the submissions for responsiveness, EOCP compliance and other issues. The City may require any Bidder to furnish statement of experience, financial responsibility, technical ability, equipment, and references.
- 2.6. RECAPITULATION OF THE WORK.** Bids shall not contain any recapitulation of the Work. Conditional Bids may be rejected as being non-responsive. Alternative proposals will not be considered unless called for.
- 2.7. BIDS MAY BE WITHDRAWN** by the Bidder only up to the bid due date and time.

 - 2.7.1. Important Note:** Submission of the electronic bid into the system may not be instantaneous. Due to the speed and capabilities of the user's internet service provider (ISP), bandwidth, computer hardware and other variables, it may take time for the bidder's submission to upload and be received by the City's eBidding system. It is the bidder's sole responsibility to ensure their bids are received on time by the City's eBidding system. The City of San Diego is not responsible for bids that do not arrive by the required date and time.
- 2.8. ACCESSIBILITY AND AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE:** To request a copy of this solicitation in an alternative format, contact the Public Works Contract Specialist listed on the cover of this solicitation at least five (5) working days prior to the Bid/Proposal due date to ensure availability.

3. **ELECTRONIC BID SUBMISSIONS CARRY FULL FORCE AND EFFECT**

- 3.1. The bidder, by submitting its electronic bid, acknowledges that doing so carries the same force and full legal effect as a paper submission with a longhand (wet) signature.
 - 3.2. By submitting an electronic bid, the bidder certifies that the bidder has thoroughly examined and understands the entire Contract Documents (which consist of the plans and specifications, drawings, forms, affidavits and the solicitation documents), and that by submitting the eBid as its bid proposal, the bidder acknowledges, agrees to and is bound by the entire Contract Documents, including any addenda issued thereto, and incorporated by reference in the Contract Documents.
 - 3.3. The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certification, forms and affidavits submitted as part of this bid are true and correct.
 - 3.4. The Bidder agrees to the construction of the project as described in Attachment "A-Scope of Work" for the City of San Diego, in accordance with the requirements set forth herein for the electronically submitted prices. The Bidder guarantees the Contract Price for a period of 120 days (90 days for federally funded contracts and contracts valued at \$500,000 or less) from the date of Bid opening. The duration of the Contract Price guarantee shall be extended by the number of days required for the City to obtain all items necessary to fulfill all conditions precedent.
4. **BIDS ARE PUBLIC RECORDS:** Upon receipt by the City, Bids shall become public records subject to public disclosure. It is the responsibility of the respondent to clearly identify any confidential, proprietary, trade secret or otherwise legally privileged information contained within the Bid. General references to sections of the California Public Records Act (PRA) will not suffice. If the Contractor does not provide applicable case law that clearly establishes that the requested information is exempt from the disclosure requirements of the PRA, the City shall be free to release the information when required in accordance with the PRA, pursuant to any other applicable law, or by order of any court or government agency, and the Contractor will hold the City harmless for release of this information.
5. **CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM:**
- 5.1. **Prior** to the Award of the Contract or Task Order, you and your Subcontractors and Suppliers must register with the City's web-based vendor registration and bid management system. For additional information go to:

<http://www.sandiego.gov/purchasing/bids-contracts/vendorreg.shtml>.
 - 5.2. The City may not award the contract until registration of all subcontractors and

suppliers is complete. In the event this requirement is not met within the time frame specified in the Notice of Intent to Award letter, the City reserves the right to rescind the Notice of Award / Intent to Award and to make the award to the next responsive and responsible bidder / proposer.

6. **JOINT VENTURE CONTRACTORS:** Provide a copy of the Joint Venture agreement and the Joint Venture license to the City within 10 Working Days after receiving the Contract forms. See 7-6, "The Contractors Representative" in The GREENBOOK and 7-6.1 in The WHITEBOOK.
7. **PREVAILING WAGE RATES WILL APPLY:** Refer to Attachment D.
8. **SUBCONTRACTING PARTICIPATION PERCENTAGES:** Subcontracting participation percentages apply to this contract. Refer to Attachment E.
9. **INSURANCE REQUIREMENTS:**
 - 9.1. All certificates of insurance and endorsements required by the contract are to be provided upon issuance of the City's Notice of Intent to Award letter.
 - 9.2. Refer to sections 7-3, "LIABILITY INSURANCE", and 7-4, "WORKERS' COMPENSATION INSURANCE" of the Supplementary Special Provisions (SSP) for the insurance requirements which must be met.
10. **REFERENCE STANDARDS:** Except as otherwise noted or specified, the Work shall be completed in accordance with the following standards:

Title	Edition	Document Number
Standard Specifications for Public Works Construction ("The GREENBOOK") http://www.greenbookspecs.org/	2015	PWPI070116-01
City of San Diego Standard Specifications for Public Works Construction ("The WHITEBOOK")* https://www.sandiego.gov/publicworks/edocref/greenbook	2015	PWPI070116-02
City of San Diego Standard Drawings* https://www.sandiego.gov/publicworks/edocref/standarddraw	2016	PWPI070116-03
Citywide Computer Aided Design and Drafting (CADD) Standards https://www.sandiego.gov/publicworks/edocref/drawings	2016	PWPI092816-04
California Department of Transportation (CALTRANS) Standard Specifications – http://www.dot.ca.gov/des/oe/construction-contract-standards.html	2015	PWPI092816-05

Title	Edition	Document Number
CALTRANS Standard Plans http://www.dot.ca.gov/des/oe/construction-contract-standards.html	2015	PWPI092816-06
California Manual on Uniform Traffic Control Devices Revision 1 (CA MUTCD Rev 1) - http://www.dot.ca.gov/trafficops/camutcd/	2014	PWPIO92816-07
NOTE: *Available online under Engineering Documents and References at: http://www.sandiego.gov/publicworks/edocref/index.shtml		

- 11. CITY'S RESPONSES AND ADDENDA:** The City, at its discretion, may respond to any or all questions submitted in writing via the City's eBidding web site in the **form of an addendum**. No other responses to questions, oral or written shall be of any force or effect with respect to this solicitation. The changes to the Contract Documents through addenda are made effective as though originally issued with the Bid. The Bidders shall acknowledge the receipt of Addenda at the time of bid submission.
- 12. CITY'S RIGHTS RESERVED:** The City reserves the right to cancel the Notice Inviting Bids at any time, and further reserves the right to reject submitted Bids, without giving any reason for such action, at its sole discretion and without liability. Costs incurred by the Bidder(s) as a result of preparing Bids under the Notice Inviting Bids shall be the sole responsibility of each bidder. The Notice Inviting Bids creates or imposes no obligation upon the City to enter a contract.
- 13. CONTRACT PRICING:** This solicitation is for a Lump Sum contract with Unit Price provisions as set forth herein. The Bidder agrees to perform construction services for the City of San Diego in accordance with these contract documents for the prices listed below. The Bidder further agrees to guarantee the Contract Price for a period of 120 days from the date of Bid opening. The duration of the Contract Price guarantee may be extended, by mutual consent of the parties, by the number of days required for the City to obtain all items necessary to fulfill all contractual conditions.
- 14. SUBCONTRACTOR INFORMATION:**
- 14.1. LISTING OF SUBCONTRACTORS.** In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act" of the California Public Contract Code, the Bidder shall provide the **NAME** and **ADDRESS** of each Subcontractor who will perform work, labor, render services or who specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also state within the description, whether the subcontractor is a **CONSTRUCTOR, CONSULTANT** or **SUPPLIER**. The Bidder shall state the **DIR REGISTRATION NUMBER** for all subcontractors and shall further state within the description, the **PORTION** of the

work which will be performed by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement may result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3, "Subcontracts", which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which Bidders are seeking recognition towards achieving any mandatory, voluntary (or both) subcontracting participation goals.

14.2. LISTING OF SUPPLIERS. Any Bidder seeking the recognition of Suppliers of equipment, materials, or supplies obtained from third party Suppliers towards achieving any mandatory or voluntary (or both) subcontracting participation goals shall provide, at a minimum, the **NAME, LOCATION (CITY), DIR REGISTRATION NUMBER** and the **DOLLAR VALUE** of each supplier. The Bidder will be credited up to 60% of the amount to be paid to the Suppliers for materials and supplies unless vendor manufactures or substantially alters materials and supplies, in which case, 100% will be credited. The Bidder is to indicate within the description whether the listed firm is a supplier or manufacturer. If no indication is provided, the listed firm will be credited at 60% of the listed dollar value for purposes of calculating the Subcontractor Participation Percentage.

14.3. LISTING OF SUBCONTRACTORS OR SUPPLIERS FOR ALTERNATES. For subcontractors or suppliers to be used on additive or deductive alternate items, in addition to the above requirements, bidder shall further note "ALTERNATE" and alternate item number within the description.

15. SUBMITTAL OF "OR EQUAL" ITEMS: See Section 4-1.6, "Trade Names or Equals" in The WHITEBOOK and as amended in the SSP.

16. AWARD:

16.1. The Award of this contract is contingent upon the Contractor's compliance with all conditions precedent to Award.

16.2. Upon acceptance of a Bid, the City will prepare contract documents for execution within approximately 21 days of the date of the Bid opening and award the Contract approximately within 7 days of receipt of properly executed Contract, bonds, and insurance documents.

16.3. This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form the City Attorney's Office.

- 17. SUBCONTRACT LIMITATIONS:** The Bidder's attention is directed to Standard Specifications for Public Works Construction, Section 2-3, "SUBCONTRACTS" in The GREENBOOK and as amended in the SSP which requires the Contractor to self-perform not less than the specified amount. Failure to comply with this requirement shall render the bid **non-responsive** and ineligible for award.
- 18. AVAILABILITY OF PLANS AND SPECIFICATIONS:** Contract Documents may be obtained by visiting the City's website: <http://www.sandiego.gov/cip/>. Plans and Specifications for this contract are also available for review in the office of the City Clerk or Public Works Contracts.
- 19. ONLY ONE BID PER CONTRACTOR SHALL BE ACCEPTED:** No person, firm, or corporation shall be allowed to make, file, or be interested in more than one (1) Bid for the same work unless alternate Bids are called for. A person, firm or corporation who has submitted a sub-proposal to a Bidder, or who has quoted prices on materials to a Bidder, is not hereby disqualified from submitting a sub-proposal or quoting prices to other Bidders or from submitting a Bid in its own behalf. Any Bidder who submits more than one bid will result in the rejection of all bids submitted.
- 20. SAN DIEGO BUSINESS TAX CERTIFICATE:** The Contractor and Subcontractors, not already having a City of San Diego Business Tax Certificate for the work contemplated shall secure the appropriate certificate from the City Treasurer, Civic Center Plaza, First floor and submit to the Contract Specialist upon request or as specified in the Contract Documents. Tax Identification numbers for both the Bidder and the listed Subcontractors must be submitted on the City provided forms within these documents.
- 21. BIDDER'S GUARANTEE OF GOOD FAITH (BID SECURITY) FOR DESIGN-BID-BUILD CONTRACTS:**

 - 21.1.** For bids \$250,000 and above, bidders shall submit Bid Security at bid time. Bid Security shall be in one of the following forms: a cashier's check, or a properly certified check upon some responsible bank; or an approved corporate surety bond payable to the City of San Diego for an amount of not less than 10% of the total bid amount.
 - 21.2.** This check or bond, and the monies represented thereby, will be held by the City as a guarantee that the Bidder, if awarded the contract, will in good faith enter into the contract and furnish the required final performance and payment bonds.
 - 21.3.** The Bidder agrees that in the event of the Bidder's failure to execute this contract and provide the required final bonds, the money represented by the cashier's or certified check will remain the property of the City; and the Surety agrees that it will pay to the City the damages, not exceeding the sum of 10% of the amount of the Bid, that the City may suffer as a result of such failure.

- 21.4. At the time of bid submission, bidders must upload and submit an electronic PDF copy of the aforementioned bid security. Whether in the form of a cashier's check, a properly certified check or an approved corporate surety bond payable to the City of San Diego, the bid security must be uploaded to the City's eBidding system. Within twenty-four (24) hours after the bid due date and time, the first five (5) apparent low bidders must provide the City with the original bid security.
- 21.5. Failure to submit the electronic version of the bid security at the time of bid submission AND failure to provide the original within twenty-four (24) hours may cause the bid to be rejected and deemed **non-responsive**.

22. AWARD OF CONTRACT OR REJECTION OF BIDS:

- 22.1. This contract may be awarded to the lowest responsible and reliable Bidder.
- 22.2. Bidders shall complete ALL eBid forms as required by this solicitation. Incomplete eBids will not be accepted.
- 22.3. The City reserves the right to reject any or all Bids, to waive any informality or technicality in Bids received, and to waive any requirements of these specifications as to bidding procedure.
- 22.4. Bidders will not be released on account of their errors of judgment. Bidders may be released only upon receipt by the City within 3 Working Days of the bid opening, written notice from the Bidder which shows proof of honest, credible, clerical error of a material nature, free from fraud or fraudulent intent; and of evidence that reasonable care was observed in the preparation of the Bid.
- 22.5. A bidder who is not selected for contract award may protest the award of a contract to another bidder by submitting a written protest in accordance with the San Diego Municipal Code.
- 22.6. The City of San Diego will not discriminate in the award of contracts with regard to race, religion creed, color, national origin, ancestry, physical handicap, marital status, sex or age.
- 22.7. Each Bid package properly signed as required by these specifications shall constitute a firm offer which may be accepted by the City within the time specified herein.
- 22.8. The City reserves the right to evaluate all Bids and determine the lowest Bidder on the basis of the base bid and any proposed alternates or options as detailed herein.

23. BID RESULTS:

- 23.1.** The availability of the bids on the City's eBidding system shall constitute the public announcement of the apparent low bidder. In the event that the apparent low bidder is subsequently deemed non-responsive or non-responsible, a notation of such will be made on the eBidding system. The new ranking and apparent low bidder will be adjusted accordingly.
- 23.2.** To obtain the bid results, view the results on the City's web site, or request the results by U.S. mail and provide a self-addressed, stamped envelope. If requesting by mail, be sure to reference the bid name and number. The bid tabulations will be mailed to you upon their completion. The results will not be given over the telephone.

24. THE CONTRACT:

- 24.1.** The Bidder to whom award is made shall execute a written contract with the City of San Diego and furnish good and approved bonds and insurance certificates specified by the City within 14 days after receipt by Bidder of a form of contract for execution unless an extension of time is granted to the Bidder in writing.
- 24.2.** If the Bidder takes longer than 14 days to fulfill these requirements, then the additional time taken shall be added to the Bid guarantee. The Contract shall be made in the form adopted by the City, which includes the provision that no claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
- 24.3.** If the Bidder to whom the award is made fails to enter into the contract as herein provided, the award may be annulled and the Bidder's Guarantee of Good Faith will be subject to forfeiture. An award may be made to the next lowest responsible and reliable Bidder who shall fulfill every stipulation embraced herein as if it were the party to whom the first award was made.
- 24.4.** Pursuant to the San Diego City Charter section 94, the City may only award a public works contract to the lowest responsible and reliable Bidder. The City will require the Apparent Low Bidder to (i) submit information to determine the Bidder's responsibility and reliability, (ii) execute the Contract in form provided by the City, and (iii) furnish good and approved bonds and insurance certificates specified by the City within 14 Days, unless otherwise approved by the City, in writing after the Bidder receives notification from the City, designating the Bidder as the Apparent Low Bidder and formally requesting the above mentioned items.

- 24.5.** The award of the Contract is contingent upon the satisfactory completion of the above-mentioned items and becomes effective upon the signing of the Contract by the Mayor or designee and approval as to form the City Attorney's Office. If the Apparent Low Bidder does not execute the Contract or submit required documents and information, the City may award the Contract to the next lowest responsible and reliable Bidder who shall fulfill every condition precedent to award. A corporation designated as the Apparent Low Bidder shall furnish evidence of its corporate existence and evidence that the officer signing the Contract and bond for the corporation is duly authorized to do so.
- 25. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF WORK:** The Bidder shall examine carefully the Project Site, the Plans and Specifications, other materials as described in the Special Provisions, Section 2-7, and the proposal forms (e.g., Bidding Documents). The submission of a Bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and scope of Work, the quantities of materials to be furnished, and as to the requirements of the Bidding Documents Proposal, Plans, and Specifications.
- 26. CITY STANDARD PROVISIONS:** This contract is subject to the following standard provisions. See The WHITEBOOK for details.
- 26.1.** The City of San Diego Resolution No. R-277952 adopted on May 20, 1991 for a Drug-Free Workplace.
- 26.2.** The City of San Diego Resolution No. R-282153 adopted on June 14, 1993 related to the Americans with Disabilities Act.
- 26.3.** The City of San Diego Municipal Code §22.3004 for Contractor Standards.
- 26.4.** The City of San Diego's Labor Compliance Program and the State of California Labor Code §§1771.5(b) and 1776.
- 26.5.** Sections 1777.5, 1777.6, and 1777.7 of the State of California Labor Code concerning the employment of apprentices by contractors and subcontractors performing public works contracts.
- 26.6.** The City's Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of The San Diego Municipal Code (SDMC).
- 26.7.** The City's Information Security Policy (ISP) as defined in the City's Administrative Regulation 90.63.
- 27. PRE-AWARD ACTIVITIES:**
- 27.1.** The contractor selected by the City to execute a contract for this Work shall submit the required documentation as specified in the herein and in the Notice of Award.

Failure to provide the information as specified may result in the Bid being rejected as **non-responsive**.

- 27.2.** The decision that bid is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND

FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:

TC Construction Company, Inc., a corporation, as principal, and
Liberty Mutual Insurance Company a corporation authorized to do
business in the State of California, as Surety, hereby obligate themselves, their successors and assigns,
jointly and severally, to The City of San Diego a municipal corporation in the sum of
Six Million One Hundred Eighty Six Thousand Seven Hundred Four Dollars and Zero Cents
(\$6,186,704.00) for the faithful performance of the annexed contract, and in the sum of
Six Million One Hundred Eighty Six Thousand Seven Hundred Four Dollars and Zero Cents
(\$6,186,704.00) for the benefit of laborers and materialmen designated below.

Conditions:

If the Principal shall faithfully perform the annexed contract with the City of San Diego, California, then the obligation herein with respect to a faithful performance shall be void; otherwise it shall remain in full force.

If the Principal shall promptly pay all persons, firms and corporations furnishing materials for or performing labor in the execution of this contract, and shall pay all amounts due under the California Unemployment Insurance Act then the obligation herein with respect to laborers and materialmen shall be void; otherwise it shall remain in full force.

The obligation herein with respect to laborers and materialmen shall inure to the benefit of all persons, firms and corporations entitled to file claims under the provisions of Article 2. Claimants, (iii) public works of improvement commencing with Civil Code Section 9100 of the Civil Code of the State of California.

Changes in the terms of the annexed contract or specifications accompanying same or referred to therein shall not affect the Surety's obligation on this bond, and the Surety hereby waives notice of same.

The Surety shall pay reasonable attorney's fees should suit be brought to enforce the provisions of this bond

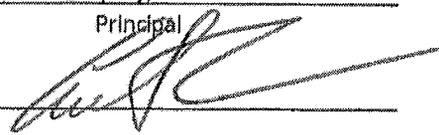
PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND (continued)

Dated January 18, 2018

Approved as to Form

TC Construction Company, Inc.

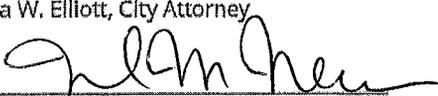
Principal

By 

AUSTIN CAMERON, PRESIDENT

Printed Name of Person Signing for Principal

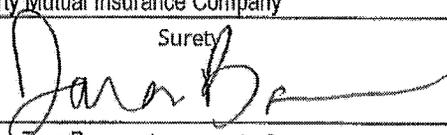
Mara W. Elliott, City Attorney

By 

Deputy City Attorney

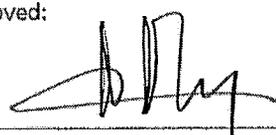
Liberty Mutual Insurance Company

Surety

By 

Tara Bacon, Attorney-in-fact

Approved:

By 

Albert P. Rechan
Deputy Director
Public Works Department

790 The City Drive, Suite 200

Local Address of Surety

Orange, CA 92868

Local Address (City, State) of Surety

714-634-3311

Local Telephone No. of Surety

Premium \$ 41,381.00

Bond No. 024067712

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

CIVIL CODE § 1189

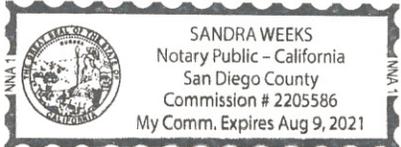
A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California)
County of San Diego)
On January 19, 2018 before me, Sandra Weeks, Notary Public
Date Here Insert Name and Title of the Officer
personally appeared Austin Cameron
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.



Signature Sandra Weeks
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Faithful Performance Bond and Labor and material men's Bond
Document Date: _____ Number of Pages: 1
Signer(s) Other Than Named Above: NA

Capacity(ies) Claimed by Signer(s)

Signer's Name: Austin Cameron
 Corporate Officer — Title(s): President
 Partner — Limited General
 Individual Attorney in Fact
 Trustee Guardian or Conservator
 Other: _____

Signer's Name: N/A
 Corporate Officer — Title(s): _____
 Partner — Limited General
 Individual Attorney in Fact
 Trustee Guardian or Conservator
 Other: _____

Signer Is Representing: TC Construction Co Inc.

Signer Is Representing: _____

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT
CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

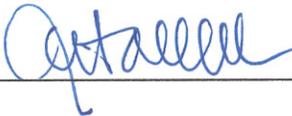
State of California
County of San Diego)

On January 18, 2018 before me, Maria Hallmark, Notary Public
(insert name and title of the officer)

personally appeared Tara Bacon,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are
subscribed to the within instrument and acknowledged to me that he/she/they executed the same in
his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the
person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing
paragraph is true and correct.

WITNESS my hand and official seal.

Signature 

(Seal)



THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Certificate No. 7552567

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company West American Insurance Company

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Bradley R. Orr; Dale G. Harshaw; Geoffrey Shelton; John R. Qualin; Kyle King; Minna Huovila; Tara Bacon

all of the city of San Diego, state of CA each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 22nd day of November, 2016.



The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
West American Insurance Company

By: David M. Carey
David M. Carey, Assistant Secretary

STATE OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 22nd day of November, 2016, before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.



COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2017
Member, Pennsylvania Association of Notaries

By: Teresa Pastella
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS – Section 12. Power of Attorney. Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts – SECTION 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 18th day of January, 2018.



By: Renee C. Llewellyn
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

ATTACHMENTS

ATTACHMENT A
SCOPE OF WORK

SCOPE OF WORK

1. **SCOPE OF WORK:** Mid-City Pipeline Phase 2A will install approximately 820 linear feet of new 66" diameter CML&TC steel transmission main. Within this 820 linear feet is approximately 62' of tunneling under a San Diego County Water Authority aqueduct. The tunneling consists of a minimum 82" diameter steel casing. Two 4 inch diameter fiber optic conduits will be installed with the water pipeline and work also includes SCADA improvements and an insertable flow meter for the Murray 2nd Pipeline, as well as, associated required street ADA improvements and paving. The 66-inch transmission main will run southward down 69th street from the 69th and Mohawk Street Intersection to a point approximately 350' west of 69th street in El Cajon Boulevard. The north terminus of the pipeline will be connected to 69th and Mohawk Pump Station. The south terminus will connect to the Mid-City Pipeline Phase 1 at the San Diego/SDCWA FCF 18/21 on El Cajon Boulevard between 68th Street and 69th Street.
 - 1.1. The Work shall be performed in accordance with:
 - 1.1.1. The Notice Inviting Bids and Plans numbered **39739-01-D** through **39739-39-D**, and **39739-T01-D** through **39739-T12-D**, inclusive.
2. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **\$4,000,000**.
3. **LOCATION OF WORK:** The location of the Work is as follows:

See Appendix E - Location Map.
4. **CONTRACT TIME:** The Contract Time for completion of the Work shall be **260 Working Days**.

ATTACHMENT B
PHASED FUNDING PROVISIONS

PHASED FUNDING PROVISIONS

1. PRE-AWARD

- 1.1.** Within 10 Working Days after the Bid Opening date, the Apparent Low Bidder must contact the Project Manager to discuss fund availability for each phase and shall also submit the following:
 - 1.1.1.** Construction Cost Loaded Schedule in accordance with 6-1, "CONSTRUCTION SCHEDULE AND COMMENCEMENT OF THE WORK" and 9-3, "PAYMENT.
- 1.2.** Your failure to perform any of the following may result cancelling your award of the Contract:
 - 1.2.1.** Meeting with the City's Project Manager to discuss the Phased Funding Schedule.
 - 1.2.2.** Agreeing to a Phased Funding Schedule within 22 Working Days after meeting with the City's Project Manager.

2. POST-AWARD

- 2.1.** Do not start any construction activities for the next phase until the NTP has been issued by the Engineer. The City will issue separate Notice to Proceed (NTP) documents for each phase.
- 2.2.** If requested, the Engineer may issue the NTP for the next phase before the end of the current approved phase.

PHASED FUNDING SCHEDULE AGREEMENT

The particulars left blank in this sample, such as the total number of phases and the amounts assigned to each phase, will be completed with funding specific information from the Pre-Award Schedule and Construction Cost Loaded Schedule submitted to and approved by the City.

BID NUMBER: K-18-1545-DBB-3

CONTRACT OR TASK TITLE: Mid City Pipeline Phase 2A

CONTRACTOR: TC Construction Company, Inc.

Funding Phase	Phase Description	Phase Start	Phase Finish	Not-to-Exceed Amount
1	Insurance, bonds, submittals, potholing, Mobilization, valves procurement, geotechnical, shoring, ground permeation grouting, Jack & Bore, install carrier pipe, welding, grouting, remove receiving pit, Access Manway, Trench restorations, install valves and cathodic protections, Traffic controls, Community Liaison, etc.	NTP	9/30/2018	\$3,700,000.00
2	Video inspections, Fiber optic, SCADA, insertion flow meter, Baptist church work, Fabrication, curb ramps, install valves and cathodic protections, paving, Traffic Controls, Community Liaison, close out, etc.	10/1/2018	NOC	\$2,486,704.00
Contract Total				\$6,186,704.00

Notes:

- 1) WHITEBOOK section 9-3.6, "Phased Funding Compensation" applies.
- 2) The total of all funding phases shall be equal to the TOTAL BID PRICE as shown on BID SCHEDULE 1 - PRICES.
- 3) This PHASED FUNDING SCHEDULE AGREEMENT will be incorporated into the CONTRACT and shall only be revised by written modifications to the CONTRACT.

CITY OF SAN DIEGO

PRINT NAME: Steve Lindsay
Construction Manager
 Signature: 
 Date: 2/7/18

CONTRACTOR

PRINT NAME: Austin Cameron
 Title: President
 Signature: 

PRINT NAME: Maryam Kargar
Project Manager
 Signature: 
 Date: 2/5/2018

ATTACHMENT C
INTENTIONALLY LEFT BLANK

ATTACHMENT D
PREVAILING WAGES

PREVAILING WAGES

1. **PREVAILING WAGE RATES:** Pursuant to San Diego Municipal Code section 22.3019, construction, alteration, demolition, repair and maintenance work performed under this Contract is subject to State prevailing wage laws. For construction work performed under this Contract cumulatively exceeding \$25,000 and for alteration, demolition, repair and maintenance work performed under this Contract cumulatively exceeding \$15,000, the Contractor and its subcontractors shall comply with State prevailing wage laws including, but not limited to, the requirements listed below.
 - 1.1. **Compliance with Prevailing Wage Requirements.** Pursuant to sections 1720 through 1861 of the California Labor Code, the Contractor and its subcontractors shall ensure that all workers who perform work under this Contract are paid not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations (DIR). This includes work performed during the design and preconstruction phases of construction including, but not limited to, inspection and land surveying work.
 - 1.1.1. Copies of such prevailing rate of per diem wages are on file at the City and are available for inspection to any interested party on request. Copies of the prevailing rate of per diem wages also may be found at <http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm>. Contractor and its subcontractors shall post a copy of the prevailing rate of per diem wages determination at each job site and shall make them available to any interested party upon request.
 - 1.1.2. The wage rates determined by the DIR refer to expiration dates. If the published wage rate does not refer to a predetermined wage rate to be paid after the expiration date, then the published rate of wage shall be in effect for the life of this Contract. If the published wage rate refers to a predetermined wage rate to become effective upon expiration of the published wage rate and the predetermined wage rate is on file with the DIR, such predetermined wage rate shall become effective on the date following the expiration date and shall apply to this Contract in the same manner as if it had been published in said publication. If the predetermined wage rate refers to one or more additional expiration dates with additional predetermined wage rates, which expiration dates occur during the life of this Contract, each successive predetermined wage rate shall apply to this Contract on the date following the expiration date of the previous wage rate. If the last of such predetermined wage rates expires during the life of this Contract, such wage rate shall apply to the balance of the Contract.
 - 1.2. **Penalties for Violations.** Contractor and its subcontractors shall comply with California Labor Code section 1775 in the event a worker is paid less than the prevailing wage rate for the work or craft in which the worker is employed.
 - 1.3. **Payroll Records.** Contractor and its subcontractors shall comply with California Labor Code section 1776, which generally requires keeping accurate payroll records,

verifying and certifying payroll records, and making them available for inspection. Contractor shall require its subcontractors to also comply with section 1776. Contractor and its subcontractors shall submit weekly certified payroll records online via the City's web-based Labor Compliance Program. Contractor is responsible for ensuring its subcontractors submit certified payroll records to the City.

1.3.1. For contracts entered into on or after April 1, 2015, Contractor and their subcontractors shall furnish records specified in Labor Code section 1776 directly to the Labor Commissioner in the manner required by Labor Code section 1771.4.

1.4. Apprentices. Contractor and its subcontractors shall comply with California Labor Code sections 1777.5, 1777.6 and 1777.7 concerning the employment and wages of apprentices. Contractor is held responsible for the compliance of their subcontractors with sections 1777.5, 1777.6 and 1777.7.

1.5. Working Hours. Contractor and their subcontractors shall comply with California Labor Code sections 1810 through 1815, including but not limited to: (i) restrict working hours on public works contracts to eight hours a day and forty hours a week, unless all hours worked in excess of 8 hours per day are compensated at not less than 1½ times the basic rate of pay; and (ii) specify penalties to be imposed on design professionals and subcontractors of \$25 per worker per day for each day the worker works more than 8 hours per day and 40 hours per week in violation of California Labor Code sections 1810 through 1815.

1.6. Required Provisions for Subcontracts. Contractor shall include at a minimum a copy of the following provisions in any contract they enter into with a subcontractor: California Labor Code sections 1771, 1771.1, 1775, 1776, 1777.5, 1810, 1813, 1815, 1860 and 1861.

1.7. Labor Code Section 1861 Certification. Contractor in accordance with California Labor Code section 3700 is required to secure the payment of compensation of its employees and by signing this Contract, Contractor certifies that "I am aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this Contract."

1.8. Labor Compliance Program. The City has its own Labor Compliance Program authorized in August 2011 by the DIR. The City will withhold contract payments when payroll records are delinquent or deemed inadequate by the City or other governmental entity, or it has been established after an investigation by the City or other governmental entity that underpayment(s) have occurred. For questions or assistance, please contact the City of San Diego's Equal Opportunity Contracting Department at 619-236-6000.

1.9. Contractor and Subcontractor Registration Requirements. This project is subject to compliance monitoring and enforcement by the DIR. As of March 1, 2015, no contractor or subcontractor may be listed on a bid or proposal for a public works project unless registered with the DIR pursuant to Labor Code section 1725.5. As of April 1, 2015, a contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, or enter into any contract for public work, unless currently registered and qualified to perform public work pursuant to Labor Code section 1725.5. By submitting a bid or proposal to the City, Contractor is certifying that he or she has verified that all subcontractors used on this public work project are registered with the DIR in compliance with Labor Code sections 1771.1 and 1725.5, and Contractor shall provide proof of registration to the City upon request.

1.9.1. A Contractor's inadvertent error in listing a subcontractor who is not registered pursuant to Labor Code section 1725.5 in response to a solicitation shall not be grounds for filing a bid protest or grounds for considering the bid non-responsive provided that any of the following apply: (1) the subcontractor is registered prior to bid opening; (2) within twenty-four hours after the bid opening, the subcontractor is registered and has paid the penalty registration fee specified in Labor Code section 1725.5; or (3) the subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.

ATTACHMENT E
SUPPLEMENTARY SPECIAL PROVISIONS

SUPPLEMENTARY SPECIAL PROVISIONS

The following Supplementary Special Provisions (SSP) modifies the following documents:

1. The **2015 Edition** of the Standard Specifications for Public Works Construction (The "GREENBOOK").
2. The **2015 Edition** of the City of San Diego Standard Specifications for Public Works Construction (The "WHITEBOOK"), addressed as the "City Supplement" herein, including the following:
 - a) General Provisions (A) for all Contracts.

SECTION 1 – TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE, AND SYMBOLS

1-2 TERMS AND DEFINITIONS. To the "WHITEBOOK", ADD the following:

The **Inlay** shall follow the same specification requirements as overlay.

To the "WHITEBOOK", item 54, "Normal Working Hours", ADD the following:

The **Normal Working Hours** are as follows:

1. See Traffic Control Plans for alternate times and locations at no additional cost to City.
2. Harriet Tubman Charter School: When working adjacent to the school during the school year (August 22, 2017 through June 14, 2018) work hours shall exclude a one hour window during drop-offs (7:30 AM to 8:30 AM) and a one hour window during pickup (2:15 PM to 3:15 PM) during normal school days except on days of early dismissal as shown below. The following days are "No School" and "Early Dismissal" days:
 - September 1
 - September 4: Labor Day
 - October 9: Teacher Work Day
 - November 10: Veteran's Day
 - November 13: Teacher Work Day
 - November 14-17: Dismissal at 1:00 pm
 - November 20-24: Thanksgiving Break
 - December 15: Dismissal at 12:00 pm
 - December 18-January 2: Christmas Break
 - January 15: Martin Luther King Day
 - February 16, 19: President's Day Break

- March 12: Teacher Work Day
- March 13-16: Dismissal at 1:00 pm
- March 26-30: Spring Break
- May 28: Memorial Day
- June 14: Dismissal at 1:00 pm

The contractor will need to coordinate with the school once a project schedule has been established and to find out the school's schedule for the 2018-2019 calendar year. The contractor's project schedule will need to accommodate the school's calendar for the 2017-2018 and 2018-2019 school years.

3. All work in and around the SDA Church at the southeast corner of 69th and Mohawk Street shall be coordinated with the Church officials.
4. All work in and around the Del Cerro Baptist Church shall be coordinated with the Del Cerro Church officials. Also work in this area shall **not** occur during the following times:
 - No work on Thursdays
 - Work days shall end at 4:00 pm the rest of the week (M, T, W, F)
 - No work during the months of November or December

The schedule shown above for the Del Cerro Church is subject to change. Contractor shall work with the church officials to determine any schedule updates prior to beginning construction.

SECTION 2 - SCOPE AND CONTROL OF WORK

2-3.2 Self Performance. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. You shall perform, with your own organization, Contract Work amounting to at least 50% of the base Bid **AND** 50% of any alternates.

2-5.3.2 Working Drawings. To the "WHITEBOOK", TABLE 2-5.3.2, ADD the following:

Item	Section No.	Title	Subject
18	209-2.2.2 and 306-8.1	Fabricated Steel Pipe, specials, joints and appurtenances	Steel Pipe
19	13300	Instrumentation and Control	Submittals
20	13370	Control Panels	Submittals

2-5.3.3

Shop Drawings. To the “GREENBOOK”, TABLE 2-5.3.3, ADD the following:

Item	Section No.	Title	Subject
7	02341	Permeation Grouting	Submittals
8	02441	Contact Grouting	Submittals
9	02443	Microtunneling	Submittals
10	02445	Installation of Carrier Pipe in Steel Casing	Submittals
11	13300	Instrumentation and Control	Submittals
12	13370	Control Panels	Submittals
13	13374	Control Panel Instrumentation	Submittals
14	13390	Communications	Submittals
15	13414	Insertion Magnetic Flowmeter	Submittals
16	13430	Pressure Transmitter	Submittals
17	15102	Triple Offset Metal Seated BFV	Submittals
18	16010	Basic Electrical Requirements	Submittals
19	16120	Wires and Cables	Submittals
20	16190	Supporting Devices	Submittals
21	16195	Electrical Identification	Submittals
22	16450	Grounding	Submittals
23	16640	Cathodic Protection	Submittals

2-5.3.4

Supporting Information. To the “WHITEBOOK”, ADD the following:

3. Steel pipe submittals per Section 209-2.2.2 and 306-8.1
4. Provide supporting information as required by items listed in Section 2-5.3.3.

2-7

SUBSURFACE DATA. To the “WHITEBOOK”, ADD the following:

4. In preparation of the Contract Documents, the designer has relied upon the following reports of explorations and tests of subsurface conditions at the Work Site:
 - a) Geotechnical Investigation, City of San Diego’s Design of Mid-City Pipeline - Phase 2 Project, San Diego and La Mesa, California, dated June 18, 2015, prepared by Southland Geotechnical Consultants.
 - b) Pothole Report – Project # X140197, Utility Locating and Potholing Area: 69th Street/70th Street/Lake Murray Blvd., San Diego, CA, dated March 2015, prepared by Airx Utility Surveyors.
 - c) Monitoring Well Installation and Groundwater Sampling, Mid-City Pipeline Phase 2, San Diego, California, dated July 27, 2015, prepared by Southern California Soil and Testing.

5. The reports listed above are available for review by contacting the Contract Specialist or visiting:

<https://filecloud.sandiego.gov/url/cedp4qeirhnpe9m3>

2-9.2 Survey Service. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

Surveying services shall be provided by the City except for the survey required by the tunneling work as noted in Technical Specification Section 02443, Microtunneling.

2-10 AUTHORITY OF THE BOARD AND THE ENGINEER. To the "GREENBOOK", Paragraph (2), DELETE in its entirety and SUBSTITUTE with the following:

The decision of the Engineer is final and binding on all questions relating to: quantities; acceptability of material, equipment, or work; execution, progress or sequence of work; requests for information (RFI), and interpretation of the Plans, Specifications, or other Contract Documents. This shall be precedent to any payment under the Contract. The Engineer shall be the single point of contact and shall be included in all communications.

2-14.3 Coordination. To the "WHITEBOOK", ADD the following:

2. Other adjacent City projects are scheduled for construction for the same time period in the vicinity of 69th and Mohawk Street intersection. See Appendix "F" for the approximate location. Coordinate the Work with the adjacent projects as listed below:

- a) 69th and Mohawk Pump Station, WBS No. S-12011, City Project Manager is John Stohr (619)533-6626.

2-16 CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM. To the "WHITEBOOK", item 1, DELETE in its entirety.

SECTION 3 – CHANGES IN WORK

3-5.1 Claims. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

ADD:

3-5.1 Claims.

1. A Claim is a written demand by you that seeks an adjustment in the Contract Price, Contract Time, or other relief associated with a dispute arising under or relating to the Contract, including a breach of any provision thereof. A voucher, invoice, or other routine request for payment is not a Claim.
2. A Claim shall conform to these specifications and may be considered after the City has previously denied a request by you for a Change Order seeking the demanded relief.

3. You shall submit a Claim to the Engineer if a dispute occurs that arises from or relates to the Contract. The Claim shall seek all relief to which you assert you are entitled as a result of the event(s) giving rise to the dispute. Your failure to process a Claim in accordance with these specifications shall constitute a waiver of all relief associated with the dispute. Claims are subject to 6-11, "Right to Audit".
4. You shall continue to perform the Services and Work and shall maintain the Schedule during any dispute proceedings. The Engineer will continue to make payments for undisputed Services and Work.
5. The City's Claims process specified herein shall not relieve you of your statutory obligations to present claims prior to any action under the California Government Code.

3-5.1.1 Initiation of Claim.

1. You shall promptly, but no later than 30 Days after the event(s) giving rise to the Claim, deliver the Claim to the Engineer.
2. You shall not process a Claim unless the Engineer has previously denied a request by you for a Change Order that sought the relief to be pursued in the claim.

3-5.1.1.1 Claim Certification Submittal.

1. If your Claim seeks an increase in the Contract Price, the Contract Time, or both, submit with the Claim an affidavit certifying the following:
 - a) The Claim is made in good faith and covers all costs and delays to which you are entitled as a result of the event(s) giving rise to the Claim.
 - b) The amount claimed accurately reflects the adjustments in the Contract Price, the Contract Time, or both to which you believe you are entitled.
 - c) All supporting costs and pricing data are current, accurate, and complete to the best of your knowledge. The cost breakdown per item of Work shall be supplied.
 - d) You shall ensure that the affidavit is executed by an official who has the authority to legally bind you.

3-5.1.2 Initial Determination.

1. The Engineer will respond in writing to your Claim within 30 Days of receipt of the Claim.

3-5.1.3 Settlement Meeting.

1. If you disagree with the Initial Determination, you shall request a Settlement Meeting within 30 Days. Upon receipt of this request, the Engineer will schedule the Settlement Meeting within 15 Working Days.

3-5.1.7 City's Final Determination.

1. If a settle agreement is not reached, the City shall make a written Final Determination within 10 Working Days after the Settlement Meeting.
2. If you disagree with the City's Final Determination, notify the Engineer in writing of your objection within 15 Working Days after receipt of the written determination and file a "Request for Mediation" in accordance with 3-5.2, "Dispute Resolution Process".
3. Failure to give notice of objection within the 15 Working Days period shall waive your right to pursue the Claim.

3-5.1.8 Mandatory Assistance.

1. If a third party dispute, litigation, or both arises out of or relates in any way to the Services provided under the Contract, upon the City's request, you shall agree to assist in resolving the dispute or litigation. Your assistance includes, but is not limited to the following:
 - a) Providing professional consultations.
 - b) Attending mediations, arbitrations, depositions, trials, or any event related to the dispute resolution and litigation.

3-5.1.8.1 Compensation for Mandatory Assistance.

1. The City will reimburse you for reasonable fees and expenses incurred by you for any required assistance rendered in accordance with 3-5.1.8, "Mandatory Assistance" as Extra Work.
2. The Engineer will determine whether these fees and expenses were necessary due to your conduct or failure to act.
3. If the Engineer determines that the basis of the dispute or litigation in which these fees and expenses were incurred were the result of your conduct or your failure to act in part or in whole, you shall reimburse the City for any payments made for these fees and expenses.
4. Reimbursement may be through any legal means necessary, including the City's withholding of your payment.

3-5.2.3 Selection of Mediator. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. A single mediator, knowledgeable in construction aspects and acceptable to both parties, shall be used to mediate the dispute.
2. To initiate mediation, the initiating party shall serve a Request for Mediation at the American Arbitration Association (AAA) on the opposing party.
3. If AAA is used, the initiating party shall concurrently file with AAA a "Request for Mediation" along with the appropriate fees, a copy of requested mediators marked in preference order, and a preference for available dates.

4. If AAA is selected to coordinate the mediation (Administrator), within 10 Working Days from the receipt of the initiating party's Request for Mediation, the opposing party shall file the following:
 - a) A copy of the list of the preferred mediators listed in preference order after striking any mediators to which they have any objection.
 - b) A preference for available dates.
 - c) Appropriate fees.
5. If the parties cannot agree on a mediator, then each party shall select a mediator and those mediators shall select the neutral third party to mediate the matter.

3-5.3 Forum of Litigation. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. It is the express intention that all legal actions and proceedings related to the Contract or Agreement with the City or to any rights or any relationship between the parties arising therefrom shall be solely and exclusively initiated and maintained in courts of the State of California for the County of San Diego.

SECTION 4 - CONTROL OF MATERIALS

4-1.3.1 General. To the "WHITEBOOK", ADD the following:

1. Steel pipe in sizes larger than 18 inches shall require inspection at the source of production.
2. City lab staff or a qualified inspection agency approved by the Engineer shall witness all welding, lining, coating, and testing. You shall incur additional inspection costs outlined in 4-1.3.3, "Inspection of Items Not Locally Produced".
3. All parts of production (including but not limited to product fabrication, welding, testing, lining, and coating of straight pieces and specials) shall be performed or produced in the United States.
4. Welding and all testing shall be performed by certified welders and testing staff with credentials traceable in the United States.

4-1.3.2 Inspection by the Agency. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. The City will provide inspection and testing laboratory services within the continental United States within a 200-mile radius of the geographical limits of the City.

4-1.3.3 Inspection of Items Not Locally Produced. To the "WHITEBOOK", DELETE in its entirety.

ADD

4-1.3.3 Inspection of Items Not Locally Produced. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. When you intend to purchase materials, fabricated products, or equipment from sources located more than 200 miles (321.9 km) outside the geographical limits of the City, City Lab staff or a qualified inspection agency approved by the Engineer, shall be engaged at your expense to inspect the materials, equipment, or process.
2. This approval shall be obtained before producing any material or equipment. City Lab staff or inspector shall evaluate the materials for conformance with the requirements of the Plans and Specifications. You shall forward reports required by the Engineer. No materials or equipment shall be shipped nor shall any processing, fabrication or treatment of such materials be done without proper inspection by City Lab staff or the approved agent. Approval by said agent shall not relieve you of responsibility for complying with the requirements of the Contract Documents.
3. The Engineer may elect City Lab staff to perform inspection of an out-of-town manufacturer. You shall incur additional inspection costs of the Engineer including lodging, meals, and incidental expenses based on Federal Per Diem Rates, along with travel and car rental expenses. If the manufacturing plant operates a double shift, a double shift shall be figured in the inspection costs.
 - a) At the option of the Engineer, full time inspection shall continue for the length of the manufacturing period. If the manufacturing period will exceed 3 consecutive weeks, you shall incur additional inspection expenses of the Engineer's supervisor for a trip of 2 Days to the site per month.
 - b) When the Engineer elects City Lab staff to perform out-of-town inspections, the wages of staff employed by the City shall not be part of the additional inspection expenses paid by you.
 - c) Federal Per Diem Rates can be determined at the location below:

<https://www.gsa.gov/portal/content/104877>

4-1.3.4 Inspection Paid For By the Contractor. To the "WHITEBOOK", ADD the following:

1. The special inspections required are listed as follows:
 - a) Welding of Pipelines (Welding Inspectors)
 - b) Third party inspection of manufacture of valves 48" and larger.
 - c) Third party inspection of manufacture of steel pipe.

4-1.3.5 Special Inspection. To the "WHITEBOOK", ADD the following:

5. The payment for special inspection Work specified under this section shall be paid in accordance with 4-1.3.4.1, "Payment".

- 4-1.3.6 Preapproved Materials.** To the "WHITEBOOK", ADD the following:
3. You shall submit in writing a list of all products to be incorporated in the Work that are on the AML.

- 4-1.6 Trade Names or Equals.** To the "WHITEBOOK", ADD the following:
11. You shall submit your list of proposed substitutions for an "equal" item **no later than 5 Working Days after the determination of the Apparent Low Bidder** and on the City's Product Submittal Form available at:

<http://www.sandiego.gov/publicworks/edocref/index.shtml>

SECTION 5 - UTILITIES

- 5-2 PROTECTION.** To the "WHITEBOOK", item 2, ADD the following:
- g) Refer to Appendix "K" for more information on the protection of AMI devices.

- 5-6 COOPERATION.** To the "GREENBOOK", ADD the following:
1. Notify SDG&E at least 10 Working Days prior to excavating within 10 feet of SDG&E Underground High Voltage Transmission Power Lines (69 KV and higher).

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

- 6-1.1 Construction Schedule.** To the "WHITEBOOK", To the "WHITEBOOK", item 22, subsection b, DELETE in its entirety and SUBSTITUTE with the following:
- b) A curve value percentage comparison between the Contract Price and the updated cash flow forecast for each Project ID included in the Contract Documents. Curve values shall be set on a scale from 0% to 100% in intervals of 5% of the Contract Time. Refer to the Sample City Invoice materials in the Contract Documents and use the format shown. Your invoice amounts shall be supported by this curve value percentage. For previous periods, use the actual values and percentages and update the curve value percentages accordingly.
- 6-2.1 Moratoriums.** To the "WHITEBOOK", ADD the following:
3. Do not Work in the Areas where there is currently a moratorium issued by the City. The areas subject to moratorium are listed here:
 - a) All work related to the Murray 2nd Pipeline Meter and SCADA installation (adjacent to the Del Cerro Baptist Church), must meet wildlife mitigation requirements as discussed in the Environmental Documentation in Appendix A. These requirements may impact the schedule from February 1 to September 15 (inclusive).

ADD:

6-3.2.1.1 Environmental Document.

1. The City of San Diego Environmental Analysis Section (EAS) of the Development Services Department has prepared a **Final Mitigated Negative Declaration** for the **Montezuma PPL/Mid City Pipeline PH 2**, as referenced in the Contract Appendix. You shall comply with all requirements of the **Final Mitigated Negative Declaration** as set forth in Appendix A.
2. Compliance with the City's environmental document shall be included in the Contract Price.

6-3.2.2 Archeological and Native American Monitoring Program. To the "WHITEBOOK", ADD the following:

4. The Contractor will retain a qualified archaeologist for this Contract. You shall coordinate your activities and Schedule with the activities and schedules of the archaeologist monitor. Notify the Engineer before noon of the Working Day before monitoring is required. See 2-11, "INSPECTION" for details.

6-3.2.3 Paleontological Monitoring Program. To the "WHITEBOOK", ADD the following:

3. The Contractor will retain a qualified paleontologist for this Contract. You shall coordinate your activities and Schedule with the activities and schedules of the paleontologist monitor. Notify the Engineer before noon of the Working Day before monitoring is required. See 2-11, "INSPECTION" for details.

6-7.1 General. To the "WHITEBOOK", item 3, ADD the following:

- d) 30 Days for full depth asphalt final mill and resurfacing work required per SDG-107.
- e) Where shutdowns of 16 inch and larger pipes are required, there is a shutdown moratorium from May until October. Plan and schedule Work accordingly. No additional payment or Working Days will be granted for delays due to the moratorium.

6-8.3 Warranty. To the "WHITEBOOK", item 1, DELETE in its entirety and SUBSTITUTE with the following:

1. Warranty and repair all defective materials and workmanship for a period of 1 year. This call back warranty period shall start on the date that the Work was accepted by the City. Additionally, you shall warranty the Work against all latent and patent defects for a period of 10 years.

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-3 **INSURANCE** the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

7-3 **INSURANCE.**

1. The insurance provisions herein shall not be construed to limit your indemnity obligations contained in the Contract.

7-3.1 **Policies and Procedures.**

1. You shall procure the insurance described below, at its sole cost and expense, to provide coverage against claims for loss including injuries to persons or damage to property, which may arise out of or in connection with the performance of the Work by you, your agents, representatives, officers, employees or Subcontractors.
2. Insurance coverage for property damage resulting from your operations is on a replacement cost valuation. The market value will not be accepted.
3. You shall maintain this insurance for the duration of this Contract and at all times thereafter when you are correcting, removing, or replacing Work in accordance with this Contract. Your liabilities under the Contract, e.g., your indemnity obligations, is not deemed limited to the insurance coverage required by this Contract.
4. The payment for insurance shall be included in the Contract Price as bid by you. Except as specifically agreed to by the City in writing, you are not entitled to any additional payment. Do not begin any Work under this Contract until you have provided and the City has approved all required insurance.
5. Policies of insurance shall provide that the City is entitled to 30 Days (10 Days for cancellation due to non-payment of premium) prior written notice of cancellation or non-renewal of the policy. Maintenance of specified insurance coverage is a material element of the Contract. Your failure to maintain or renew coverage or to provide evidence of renewal during the term of the Contract may be treated by the City as a material breach of the Contract.

7-3.2 **Types of Insurance.**

7-3.2.1 **Commercial General Liability Insurance.**

1. Commercial General Liability Insurance shall be written on the current version of the ISO Occurrence form CG 00 01 07 98 or an equivalent form providing coverage at least as broad.
2. The policy shall cover liability arising from premises and operations, XCU (explosions, underground, and collapse), independent contractors,

products/completed operations, personal injury and advertising injury, bodily injury, property damage, and liability assumed under an insured's contract (including the tort liability of another assumed in a business contract).

3. There shall be no endorsement or modification limiting the scope of coverage for either "insured vs. insured" claims or contractual liability. You shall maintain the same or equivalent insurance for at least 10 years following completion of the Work.
4. All costs of defense shall be outside the policy limits. Policy coverage shall be in liability limits of not less than the following:

<u>General Annual Aggregate Limit</u>	<u>Limits of Liability</u>
Other than Products/Completed Operations	\$2,000,000
Products/Completed Operations Aggregate Limit	\$2,000,000
Personal Injury Limit	\$1,000,000
Each Occurrence	\$1,000,000

7-3.2.2 Commercial Automobile Liability Insurance.

1. You shall provide a policy or policies of Commercial Automobile Liability Insurance written on the current version of the ISO form CA 00 01 12 90 or later version or equivalent form providing coverage at least as broad in the amount of \$1,000,000 combined single limit per accident, covering bodily injury and property damage for owned, non-owned, and hired automobiles ("Any Auto").
2. All costs of defense shall be outside the limits of the policy.

7-3.2.3 Contractors Pollution Liability Insurance.

1. You shall procure and maintain at your expense or require your Subcontractor, as described below, to procure and maintain the Contractors Pollution Liability Insurance including contractual liability coverage to cover liability arising out of cleanup, removal, storage, or handling of hazardous or toxic chemicals, materials, substances, or any other pollutants by you or any Subcontractor in an amount not less than \$2,000,000 limit for bodily injury and property damage.
2. All costs of defense shall be outside the limits of the policy. Any such insurance provided by your Subcontractor instead of you shall be approved separately in writing by the City.
3. For approval of a substitution of your Subcontractor's insurance, you shall certify that all activities for which the Contractors Pollution Liability Insurance will provide coverage will be performed exclusively by the Subcontractor providing the insurance. The deductible shall not exceed \$25,000 per claim.

4. Contractual liability shall include coverage of tort liability of another party to pay for bodily injury or property damage to a third person or organization. There shall be no endorsement or modification of the coverage limiting the scope of coverage for either “insured vs. insured” claims or contractual liability.
5. Occurrence based policies shall be procured before the Work commences and shall be maintained for the Contract Time. Claims Made policies shall be procured before the Work commences, shall be maintained for the Contract Time, and shall include a 12 month extended Claims Discovery Period applicable to this contract or the existing policy or policies that shall continue to be maintained for 12 months after the completion of the Work without advancing the retroactive date.
6. Except as provided for under California law, the policy or policies shall provide that the City is entitled to 30 Days prior written notice (10 Days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

7-3.2.4

Contractors Hazardous Transporters Pollution Liability Insurance.

1. You shall provide at your expense or require your Subcontractor to provide, as described below, Contractors Hazardous Transporters Pollution Liability Insurance including contractual liability coverage to cover liability arising out of transportation of hazardous or toxic, materials, substances, or any other pollutants by you or any Subcontractor in an amount not less than \$2,000,000 limit per occurrence/aggregate for bodily injury and property damage.
2. All costs of defense shall be outside the limits of the policy. The deductible shall not exceed \$25,000 per claim. Any such insurance provided by a subcontractor instead of you shall be approved separately in writing by the City.
3. For approval of the substitution of Subcontractor’s insurance the Contractor shall certify that all activities for which Contractors Hazardous Transporters Pollution Liability Insurance will provide coverage will be performed exclusively by the Subcontractor providing the insurance.
4. Contractual liability shall include coverage of tort liability of another party to pay for bodily injury or property damage to a third person or organization. There shall be no endorsement or modification of the coverage limiting the scope of coverage for either “insured vs. insured” claims or contractual liability. Occurrence based policies shall be procured before the Work commences and shall be maintained for the duration of this Contract. Claims Made policies shall be procured before the Work commences, shall be maintained for the duration of this contract, and shall include a 12 month extended Claims Discovery Period applicable to this contract or the existing policy or policies that shall continue to be maintained for 12 months after the completion of the Work under this Contract without advancing the retroactive date.

5. Except as provided for under California law, the policy or policies shall provide that the City is entitled to 30 Days prior written notice (10 Days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

7-3.2.5 Contractors Builders Risk Property Insurance..

1. You shall provide at your expense, and maintain until Final Acceptance of the Work, a Special Form Builders Risk Policy or Policies. This insurance shall be in an amount equal to the replacement cost of the completed Work (without deduction for depreciation) including the cost of excavations, grading, and filling. The policy or policies limits shall be 100% of this Contract value of the Work plus 15% to cover administrative costs, design costs, and the costs of inspections and construction management.
2. Insured property shall include material or portions of the Work located away from the Site but intended for use at the Site and shall cover material or portions of the Work in transit. The policy or policies shall include as insured property scaffolding, falsework, and temporary buildings located at the Site. The policy or policies shall cover the cost of removing debris, including demolition.
3. The policy or policies shall provide that all proceeds thereunder shall be payable to the City as Trustee for the insured, and shall name the City, the Contractor, Subcontractors, and Suppliers of all tiers as named insured. The City, as Trustee, will collect, adjust, and receive all monies which may become due and payable under the policy or policies, may compromise any and all claims thereunder, and will apply the proceeds of such insurance to the repair, reconstruction, or replacement of the Work.
4. Any deductible applicable to the insurance shall be identified in the policy or policies documents and responsibility for paying the part of any loss not covered because of the application of such deductibles shall be apportioned among the parties except for the City as follows: if there is more than one claimant for a single occurrence, then each claimant shall pay a pro-rata share of the per occurrence deductible based upon the percentage of their paid claim to the total paid for insured. The City shall be entitled to 100% of its loss. You shall pay the City any portion of that loss not covered because of a deductible at the same time the proceeds of the insurance are paid to the City as trustee.
5. Any insured, other than the City, making claim to which a deductible applies shall be responsible for 100% of the loss not insured because of the deductible. Except as provided for under California law, the policy or policies shall provide that the City is entitled to 30 Days prior written notice (10 Days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

7-3.3 Rating Requirements. Except for the State Compensation Insurance Fund, all insurance required by this Contract as described herein shall be carried only by

responsible insurance companies with a rating of, or equivalent to, at least "A-, VI" by A.M. Best Company, that are authorized by the California Insurance Commissioner to do business in the State, and that have been approved by the City.

7-3.3.1 Non-Admitted Carriers. The City will accept insurance provided by non-admitted, "surplus lines" carriers only if the carrier is authorized to do business in the State and is included on the List of Approved Surplus Lines Insurers (LASLI list).

All policies of insurance carried by non-admitted carriers shall be subject to all of the requirements for policies of insurance provided by admitted carriers described herein.

7-3.4 Evidence of Insurance. Furnish to the City documents e.g., certificates of insurance and endorsements evidencing the insurance required herein, and furnish renewal documentation prior to expiration of this insurance. Each required document shall be signed by the insurer or a person authorized by the insurer to bind coverage on its behalf. We reserve the right to require complete, certified copies of all insurance policies required herein.

7-3.5 Policy Endorsements.

7-3.5.1 Commercial General Liability Insurance.

7-3.5.1.1 Additional Insured.

1. You shall provide at your expense policy endorsement written on the current version of the ISO Occurrence form CG 20 10 11 85 or an equivalent form providing coverage at least as broad.
2. To the fullest extent allowed by law e.g., California Insurance Code §11580.04, the policy shall be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured.
3. The additional insured coverage for projects for which the Engineer's Estimate is \$1,000,000 or more shall include liability arising out of:
 - a) Ongoing operations performed by you or on your behalf,
 - b) your products,
 - c) your Work, e.g., your completed operations performed by you or on your behalf, or
 - d) premises owned, leased, controlled, or used by you.
4. The additional insured coverage for projects for which the Engineer's Estimate is less than \$1,000,000 shall include liability arising out of:
 - a) Ongoing operations performed by you or on your behalf,
 - b) your products, or
 - c) premises owned, leased, controlled, or used by you.

7-3.5.1.2 Primary and Non-Contributory Coverage. The policy shall be endorsed to provide that the coverage with respect to operations, including the completed operations, if appropriate, of the Named Insured is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives. Further, it shall provide that any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

7-3.5.1.3 Project General Aggregate Limit. The policy or policies shall be endorsed to provide a Designated Construction Project General Aggregate Limit that will apply only to the Work. Only claims payments which arise from the Work shall reduce the Designated Construction Project General Aggregate Limit. The Designated Construction Project General Aggregate Limit shall be in addition to the aggregate limit provided for the products-completed operations hazard.

7-3.5.2 Commercial Automobile Liability Insurance.

7-3.5.2.1 Additional Insured. Unless the policy or policies of Commercial Auto Liability Insurance are written on an ISO form CA 00 01 12 90 or a later version of this form or equivalent form providing coverage at least as broad, the policy shall be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured, with respect to liability arising out of automobiles owned, leased, hired or borrowed by you or on your behalf. This endorsement is limited to the obligations permitted by California Insurance Code §11580.04.

7-3.5.3 Contractors Pollution Liability Insurance Endorsements.

7-3.5.3.1 Additional Insured.

1. The policy or policies shall be endorsed to include as an Insured the City and its respective elected officials, officers, employees, agents, and representatives, with respect to liability arising out of:
 - a) Ongoing operations performed by you or on your behalf,
 - b) your products,
 - c) your work, e.g., your completed operations performed by you or on your behalf, or
 - d) premises owned, leased, controlled, or used by you.

Except that in connection with, collateral to, or affecting any construction contract to which the provisions of subdivision (b) of § 2782 of the California Civil Code apply, this endorsement shall not provide any duty of indemnity coverage for the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives in any case where an

agreement to indemnify the City and its respective elected officials, officers, employees, agents, and representatives would be invalid under subdivision (b) of §2782 of the California Civil Code.

2. In any case where a claim or loss encompasses the negligence of the Insured and the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives that are not covered because of California Insurance Code §11580.04, the insurer's obligation to the City and its respective elected officials, officers, employees, agents, and representatives shall be limited to obligations permitted by California Insurance Code §11580.04.

7-3.5.3.2 Primary and Non-Contributory Coverage. The policy or policies shall be endorsed to provide that the insurance afforded by the Contractors Pollution Liability Insurance policy or policies is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives with respect to operations including the completed operations of the Named Insured. Any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

7-3.5.3.3 Severability of Interest. For Contractors Pollution Liability Insurance, the policy or policies shall provide that your insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability and shall provide cross-liability coverage.

7-3.5.4 Contractors Hazardous Transporters Pollution Liability Insurance Endorsements.

7-3.5.4.1 Additional Insured.

1. The policy or policies shall be endorsed to include as an Insured the City and its respective elected officials, officers, employees, agents, and representatives, with respect to liability arising out of:
 - a) Ongoing operations performed by you or on your behalf,
 - b) your products,
 - c) your work, e.g., your completed operations performed by you or on your behalf, or
 - d) premises owned, leased, controlled, or used by you.

Except that in connection with, collateral to, or affecting any construction contract to which the provisions of subdivision (b) of §2782 of the California Civil Code apply, this endorsement shall not provide any duty of indemnity coverage for the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives in any case where an

agreement to indemnify the City and its respective elected officials, officers, employees, agents, and representatives would be invalid under subdivision (b) of §2782 of the California Civil Code.

2. In any case where a claim or loss encompasses the negligence of the Insured and the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives that are not covered because of California Insurance Code §11580.04, the insurer's obligation to the City and its respective elected officials, officers, employees, agents, and representatives shall be limited to obligations permitted by California Insurance Code §11580.04.

7-3.5.4.2 Primary and Non-Contributory Coverage. The policy or policies shall be endorsed to provide that the insurance afforded by the Contractors Pollution Liability Insurance policy or policies is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives with respect to operations including the completed operations of the Named Insured. Any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

7-3.5.4.3 Severability of Interest. For Contractors Hazardous Transporters Pollution Liability Insurance, the policy or policies shall provide that your insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability and shall provide cross-liability coverage.

7-3.5.5 Builders Risk Endorsements.

7-3.5.5.1 Waiver of Subrogation. The policy or policies shall be endorsed to provide that the insurer will waive all rights of subrogation against the City, and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from Work performed by the Named Insured for the City.

7-3.5.5.2 Builders Risk - Partial Utilization. If the City desires to occupy or use a portion or portions of the Work prior to Acceptance in accordance with this Contract, the City will notify you and you shall immediately notify your Builder's Risk insurer and obtain an endorsement that the policy or policies shall not be cancelled or lapse on account of any such partial use or occupancy. You shall obtain the endorsement prior to the City's occupation and use.

7-3.6 Deductibles and Self-Insured Retentions. You shall pay for all deductibles and self-insured retentions. You shall disclose deductibles and self-insured retentions to the City at the time the evidence of insurance is provided.

7-3.7 Reservation of Rights. The City reserves the right, from time to time, to review your insurance coverage, limits, deductibles and self-insured retentions to determine if they are acceptable to the City. The City will reimburse you, without overhead, profit,

or any other markup, for the cost of additional premium for any coverage requested by the Engineer but not required by this Contract.

7-3.8 Notice of Changes to Insurance. You shall notify the City 30 Days prior to any material change to the policies of insurance provided under this Contract.

7-3.9 Excess Insurance. Policies providing excess coverage shall follow the form of the primary policy or policies e.g., all endorsements.

7-3.10 Architects and Engineers Professional Insurance (Errors and Omissions Insurance).

1. For Contracts with required engineering services (e.g., Design-Build, preparation of engineered Traffic Control Plans (TCP), and etc) by you, you shall keep or require all of your employees or Subcontractors, who provide professional engineering services under this contract, Professional Liability coverage with a limit of **\$1,000,000** per claim and **\$2,000,000** annual aggregate in full force and effect.
2. You shall ensure the following:
 - a) The policy retroactive date is on or before the date of commencement of the Project.
 - b) The policy will be maintained in force for a period of 3 years after completion of the Project or termination of this Contract, whichever occurs last. You agree that for the time period specified above, there will be no changes or endorsements to the policy that affect the specified coverage.
3. If professional engineering services are to be provided solely by the Subcontractor, you shall:
 - a) Certify this to the City in writing and
 - b) Agree in writing to require the Subcontractor to procure Professional Liability coverage in accordance with the requirements set forth above.

7-4 NOT USED. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

7-4 WORKERS' COMPENSATION INSURANCE AND EMPLOYERS LIABILITY INSURANCE.

1. In accordance with the provisions of §3700 of the California Labor Code, you shall provide at your expense Workers' Compensation Insurance and Employers Liability Insurance to protect you against all claims under applicable state workers compensation laws. The City, its elected officials, and employees

will not be responsible for any claims in law or equity occasioned by your failure to comply with the requirements of this section.

2. Limits for this insurance shall be not less than the following:

<u>Workers' Compensation</u>	<u>Statutory Employers Liability</u>
Bodily Injury by Accident	\$1,000,000 each accident
Bodily Injury by Disease	\$1,000,000 each employee
Bodily Injury by Disease	\$1,000,000 policy limit

3. By signing and returning the Contract you certify that you are aware of the provisions of §3700 of the Labor Code which requires every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code and you shall comply with such provisions before commencing the Work as required by §1861 of the California Labor Code.

7-4.1. Waiver of Subrogation. The policy or policies shall be endorsed to provide that the insurer will waive all rights of subrogation against the City and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from Work performed by the Named Insured for the City.

7-6 THE CONTRACTORS REPRESENTATIVE. To the "GREENBOOK", ADD the following:

1. Both the representative and alternative representative shall be employees of the Contractor and shall not be assigned to a Subcontractor unless otherwise approved by the City in writing.

7-8.6.5.1 Payment. To the "WHITEBOOK", DELETE in its entirety.

ADD:

7-8.6.5.1 Chlorination Discharge Requirements.

1. If prior approval is obtained to discharge to the sewer system, you shall discharge the chlorinated water used for testing and acceptance of new water mains to the sewer system in accordance with the Contract Documents after de-chlorination as shown on the "Chlorination Discharge Locations" Plans. You shall submit to the Engineer a "Request for Batch Discharge Authorization to Discharge Potable Pipe Flushing Water to Sewer" form. The request form is found on the City website at the following location:

https://www.sandiego.gov/sites/default/files/batch_discharge_authorization_request_1.pdf

2. When discharging to the sewer system has been approved, you shall use a totalizer flow meter to record the total volume discharged to sewer and shall submit to the Engineer a log of actual discharged water quantities, dates, and locations. Failure to report this information to the Engineer is a violation of the

authorization for discharge to the sanitary sewer. Within five (5) Working Days of the discharge, the Engineer shall report actual total flows to the sanitary sewer to the Public Utilities Department (PUD), Industrial Wastewater Control Program (IWCP).

3. If the discharge to the sewer system is not approved, you shall discharge the chlorinated water used for the testing of new mains to surface waters, storm drain inlets, or to other approved sources and you shall comply with 7-8.6.5, "Hydrostatic Discharge Requirements". All discharge activities related to the project shall comply with the State Water Resources Control Board, ORDER WQ 2014-0194-DWQ, STATEWIDE GENERAL NPDES PERMIT FOR DRINKING WATER SYSTEMS DISCHARGES as referenced by:

http://www.waterboards.ca.gov/water_issues/programs/npdes/docs/drinking_water/final_statewide_wqo2014_0194_dwq.pdf

All testing shall be conducted by a QSP.

ADD:

7-8.6.5.2 Payment.

1. The payment for complying with the discharge requirements shall be included in the Bid item for the new water main.

ADD:

7-16.1.3 Weekly Updates Recipients.

1. Submit a weekly correspondence with updates, traffic control issues and locations, lane closures, and any other pertinent information (with additional contact names given during award process) to the following recipients:

Brian Vitelle, Senior Engineer, BVitelle@sandiego.gov

Maryam Kargar, Project Manager, MKargar@sandiego.gov

Resident Engineer, TBA, XXX@sandiego.gov

7-16.3 Exclusive Community Liaison Services. To the "WHITEBOOK", ADD the following:

2. You shall retain an Exclusive Community Liaison for the Project that shall implement Work in accordance with the specifications described in 7-16.2 "Community Outreach Services" and 7-16.3 "Exclusive Community Liaison Services".

7-20 ELECTRONIC COMMUNICATION. To the "WHITEBOOK", ADD the following:

2. Virtual Project Manager shall be used on this Contract.

7-21.1 **General.** To the "WHITEBOOK", item 3, DELETE in its entirety and SUBSTITUTE with the following:

3. During the construction phase of projects, the minimum waste management reduction goal is 90% of the inert material (a material not subject to decomposition such as concrete, asphalt, brick, rock, block, dirt, metal, glass, and etc.) and 65% of the remaining project waste. You shall provide appropriate documentation, including a Waste Management Form attached as an appendix, and evidence of recycling and reuse of materials to meet the waste reduction goals specified.

7-22.17 **Monitoring of Potentially Petroleum Contaminated Soil.** To the "WHITEBOOK", ADD the following:

5. The areas of known or suspected contamination are as follows:
 - a) As shown on Construction Plans.

7-22.20 **Payment.** To the "WHITEBOOK", item b, DELETE in its entirety and SUBSTITUTE with the following:

- b) "Monitoring of Contaminated Soil" (LS).

SECTION 9 - MEASUREMENT AND PAYMENT

9-3.1 **General.** To the "GREENBOOK", ADD the following:

The bid item, "Salvage SCADA and Transport to Chollas", shall include all work necessary to remove equipment and transport to Chollas as directed by the City.

9-3.2 **Partial and Final Payment.** To the "GREENBOOK", paragraph (3), DELETE in its entirety and SUBSTITUTE with the following:

Upon commencement of the Work, an escrow account shall be established in a financial institution chosen by you and approved by the City. Documentation for an escrow payment shall have an escrow agreement signed by you, the City, and the escrow agent. From each progress payment, no less than 5% will be deducted and deposited by the City into the escrow account. Upon completion of the Contract, the City will notify the Escrow agent in writing to release the funds to you. Only the designated representative of the City shall sign the request for the release of Escrow funds.

ADD:

9-3.7 **Compensation Adjustments for Price Index Fluctuations.** To the "WHITEBOOK" ADD the following:

5. This Contract is not subject to the provisions of The "WHITEBOOK" for Compensation Adjustments for Price Index Fluctuations for paving asphalt.

SECTION 201 – CONCRETE, MORTAR AND RELATED MATERIALS

201-1.1.1 General. ADD the following:

When called for on the plans, 2 sack concrete slurry shall be 2,500 psi minimum.

SECTION 209 – PRESSURE PIPE

209 PRESSURE PIPE. To the "WHITEBOOK", ADD the following:

2. PVC products, specifically type C900 and C905, as manufactured or distributed by J-M Manufacturing Company or JM Eagle shall not be used on the Contract for pressurized pipe.

209-1.1.2 Materials. To the "WHITEBOOK", do the following:

ADD the following to item 10:

- a) The interior of bells shall be lined **as specified.**

ADD the following:

14. Bolts shall be hot-dipped galvanized tee heads made of high-strength low-alloy steel or ductile iron in accordance with AWWA C111. ASTM A307 Grade A bolts shall not to be used.
15. Fittings shall be as shown on the plans. If fitting/joint type is not noted refer to item 1.

209-2.1 General. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

This subsection specifies steel pipe and fittings for the transmission and distribution of raw, potable, or recycled water under pressure. Steel pipe shall be of the size, type, and cylinder wall thickness or pressure class shown on the Plans or specified in the Special Provisions.

Steel pipe and specials used for water transmission mains and casings shall be fabricated steel pipe conforming to the latest edition of AWWA C200. Pipe shall be as follows:

Pipe & Fitting Diameter	Pipe & Fitting Thickness	Cement Lining Thickness	Cement Mortar Coating Thickness	Joint Type (unless noted otherwise on the plans)
36"	3/8"	3/4"	1-1/4 "	Single welded lap joint on interior
48"	3/8"	3/4"	1-1/4 "	Single welded lap joint on interior
66"	1/2"	3/4"	1-1/4 "	Single welded lap joint on interior
66" (Carrier pipe in SDCWA aqueduct crossing)	1/2"	3/4"	1-1/4"	Double welded lap joint
82" min. (Casing) ¹	1" min.	NA	NA	T5, Permalok or approved equal

¹ Inside diameter of the steel casing pipe is assumed to be 82-inch but shall be finalized by the Contractor so as to provide the minimum clearance required all around the outside diameter of the final carrier pipe and fiber optic conduit(s), and to account for any installation misalignment during casing pipe advancement. The CONTRACTOR may select a greater pipe diameter or thickness for the method of work, loading characteristics, site conditions, or possible interferences; and shall be fully responsible for the sufficiency of the casing provided.

209-2.2.1 Materials. To the "GREENBOOK", in Table 209-2.2.1, Pipe, Material, ADD the following:

Steel used in the fabricated steel pipe shall comply with the physical and chemical requirements of ASTM A139, Grade C or ASTM 1018 modified to grade 42. Minimum yield strength shall be 42,000 psi. Casing pipe shall be at a minimum ASTM A36 steel.

ADD:

209-2.2.1.1 Cement Mortar Lining and Polyolefin Tape Coating. Steel pipe, fittings and specials shall be lined and coated as follows:

1. Cement mortar lining shall comply with the requirements of Table 209-2.2.1. Lining shall be trimmed as necessary to allow full operation of butterfly valves at connections to steel pipe. After trimming, any exposed portions of pipe interior shall be lined with liquid epoxy per AWWA C210.
2. External surfaces of steel pipe and specials shall be coated with a 3 part factory applied tape coating system in accordance with AWWA C214 for steel pipe and AWWA C209 for steel pipe specials, connections and fittings. Additional mechanical protection shall be provided by the application of a reinforced cement mortar armor coating applied in accordance with AWWA C205. Cement shall be ASTM C150, Type II/V and admixtures shall contain no chlorides. Lining shall be trimmed as necessary to allow full operation of butterfly valves at connections to steel pipe. Line exposed portions of pipe interior with liquid epoxy per AWWA C210.

3. All steel pipe joint exteriors shall have an 80 mil heat shrink polyolefin sleeve or field applied 3 layer tape installed after welding conforming to the requirements of AWWA C216 and approved by Engineer. Use Canusa or approved equal.
4. Circumferential steel fabric reinforcement shall be 12-gauge wire minimum per ASTM A185 or ASTM A497.
5. Allow linings and coating to cure at least 7 days at not less than 40 degrees prior to shipping to the site.
6. Hold back lining and coating from socket and spigot ends per Manufacturer's standard practices. Hold back coating from ends of butt-strap, mechanical coupling, and flanged joint pipe sufficient distance to permit field assembly of joints. Lining shall terminate at pipe ends, except where otherwise specified or where necessary to accommodate free motion of butterfly valve discs.
7. Cement-mortar lining and coating of pipe joints in field shall conform to AWWA C205 Section 4.7 and AWWA C602 Section 4-8.
8. Proposed steel pipe shall meet the requirements in Section 02445.

209-2.2.2 Submittals To the "GREENBOOK", ADD the following:

The Contractor shall furnish the following Submittals:

SUBMITTAL	DESCRIPTION	
Shop Drawings	Submit per piping shop drawing requirements. Include legible plan and profile diagram of pipe lay diagram , layout schedule, fabrication details and dimensional checks Layout schedule shall show order of installation, length and location of each pipe section and special, station and elevation of pipe invert at all changes in grade, and all data on curves and bends for both horizontal and vertical alignment. Do not manufacture pipe until shop drawings are approved.	
Catalog Data	Required for pipe, protective coating and welding rod for field welding.	
Installation Instructions	Required per installation instruction requirements.	
Certificate of Compliance	Submit coating system and application certification per certificate of compliance requirements. Manufacturer certifications.	
Test Record Transcripts	Submit mill reports and plant test reports per test record transcript requirements.	

SUBMITTAL	DESCRIPTION	
	Submit mill report showing type of steel and physical and chemical properties for each heat number of steel used in fabricating pipe.	
	Submit test reports showing physical properties of rubber used in gaskets	
Welder Qualification Certificates	Required per standard qualification procedure of ASME Boiler and Pressure Vessel Code Section IX, Welding Qualifications	

209-2.2.4 Joints. To the "GREENBOOK", ADD the following:

Unless noted otherwise on the plans, joint type for steel pipe and fittings shall be as shown in the Table 209-2.2.1.

Flanges shall be Class D per AWWA C207 with a maximum working pressure of 150psi. All nuts, bolts and washers shall be class 316 stainless steel.

209-2.2.5 Special Sections. To the "GREENBOOK", ADD the following:

Special pipe and fittings shall be furnished as follows:

1. Manufacturer shall furnish all fittings and special pieces required for closures, curves, bends, branches, manholes, outlets, connections for mainline valves, and other appurtenances required.
2. Fabricate special fittings of welded steel sheet or plate, lined and coated with cement-mortar of same type as adjoining pipe and applied as specified for lining and coating of specials in AWWA C205 and as modified herein. Butt welding shall be used, unless otherwise indicated.
3. Minimum centerline radius of elbow or bend shall be as follows. Maximum deflection at a mitered girth seam shall be 22½°.
4. Reinforce outlets at special fittings with collars, wrapper plates or crotch plates. If collar or wrapper reinforcement is used, outlet diameter shall not exceed 69% of fitting inner diameter (ID). Diameter of outlets reinforced with crotch plates may equal fitting diameter.

SECTION 212 WATER AND SEWER SYSTEM VALVES AND APPURTENANCES

212-5.2 Butterfly Valves. To the "WHITEBOOK", ADD the following:

9. Butterfly valves shall be metal seated triple offset valves per Specification Section 15102.

212-5.6 Air Release, Air/Vacuum and Combination Air Valves. To the "GREENBOOK", ADD the following:

Combination air valves shall combine the characteristics of air/vacuum valves and air release valves by exhausting accumulated air in systems under pressure and releasing or re-admitting large quantities of air, while a system is being filled or drained, respectively. They shall be of the sizes indicated on the Drawings, with flanged or threaded ends to match adjacent piping. Bodies shall be of high-strength cast iron per ASTM A126, Class B. The float, washers, nuts and bolts and all moving parts shall be constructed of Type 316 stainless steel. Seat shall be BUNA-N.. Air/vacuum valves shall be designed for minimum 250-psi (as applicable) water working pressure, unless otherwise indicated.

Manufacturers shall be APCO, Val-Matic, GA Industries or approved equal.

Air release, air/vacuum, and/or combination air valves shall be installed at high points in piping systems and where indicated on the Drawings.

All valves shall be installed in accordance with the manufacturer's printed recommendations.

Combination air and vacuum valves shall have piped outlets to the nearest acceptable drain, firmly supported, and installed in such a way as to avoid splashing and wetting of floors.

SECTION 217 - BEDDING AND BACKFILL MATERIALS

217-1.1 General. To the "WHITEBOOK", ADD the following:

Bedding material for steel pipe shall be $\frac{3}{4}$ " crushed rock wrapped in filter fabric. Filter fabric shall comply with AASHTO M 288-15, Class 2 and shall be Mirafi 160N or approved equal.

217-2.2 Stones, Boulders, and Broken Concrete. To the "GREENBOOK", Table 217-2.2, DELETE in its entirety and SUBSTITUTE with the following:

TABLE 217-2.2

Zone	Zone Limits	Maximum Size (greatest dimension)	Backfill Requirements in Addition to 217-2.1
Street or Surface Zone	From ground surface to 12" (300 mm) below pavement subgrade or ground surface	2.5" (63 mm)	As required by the Plans or Special Provisions.
Street or Surface Zone Backfill of Tunnels beneath Concrete Flatwork		Sand	Sand equivalent of not less than 30.
Trench Zone	From 12" (300 mm) below pavement subgrade or ground surface to 12" (300 mm) above top of pipe or box	6" (150 mm)	
Deep Trench Zone (Trenches 3' (0.9 m) wide or wider)	From 60" (1.5 m) below finished surface to 12" (300 mm) above top of pipe or box	Rocks up to 6" (150 mm) excavated from trench may be placed as backfill	
Pipe Zone	From 12" (300 mm) above top of pipe or box to 6" (150 mm) below bottom of pipe or box exterior	See Section 217-1 above.	Sand equivalent of not less than 30 or a coefficient of permeability greater than 1-½ inches/hour (35 mm per hour).
Overexcavation	Backfill more than 6" (150 mm) below bottom of pipe or box exterior	6" (150 mm)	Sand equivalent of not less than 30 or a coefficient of permeability greater than 1-½ inches/hour (35 mm per hour). Trench backfill slurry (100-E-100) per 201-1 may also be used.

SECTION 302 – ROADWAY SURFACING

302-1.12 Payment. To the "WHITEBOOK", ADD the following:

- The payment for "Cold Mill AC Pavement (1-1/2inch -3inch) shall be paid per square foot and shall include all work necessary to prepare, mill and replace the pavement.

302-3.2 Payment. To the "WHITEBOOK", item 1, DELETE in its entirety and SUBSTITUTE with the following:

- The payment for "Asphalt Pavement Repair" shall be paid per ton and shall include all work necessary to prepare the site, remove the existing pavement section, provide subgrade preparation and replace the asphalt pavement and base shall be included in the Bid item for "Asphalt Pavement Repair". No payment shall be made for areas of over-excavation or outside trench areas in utility Works unless previously approved by the Engineer. No payment for pavement replacement will be made when the damage is due to your failure to protect existing improvements. You shall reimburse the City for the cost of retesting all failing compaction tests.

302-5.9 Measurement and Payment. To the WHITEBOOK", item 2, DELETE in its entirety and SUBSTITUTE with the following:

2. Payment for asphalt concrete shall be included in the Bid item for "Asphalt Concrete Overlay".

302-7.4 Payment. To the "WHITEBOOK", item 1, last sentence, DELETE in its entirety and SUBSTITUTE with the following:

Payment shall not be made for additional fabric for overlapped areas.

SECTION 303 –CONCRETE AND MASONRY CONSTRUCTION

303-1.11 PAYMENT. To the "GREENBOOK", ADD the following:

Payment for each access manway shall be included in the bid item for "5'x7' Access Manways" and shall include any excavation, compaction, backfill, gravel base, shoring, and any other items of work as shown on the construction plans and in the details.

303-5.10.2 PAYMENT. To the "WHITEBOOK", ADD the following:

4. Payment for each curb ramp or modified curb ramp shall also include removal and replacement of all hardscape, landscape and irrigation, curb and gutter, handrails, ramps, drainage structures and pipe and any other work needed for the construction of the curb ramps.

SECTION 304 –METAL FABRICATION AND CONSTRUCTION

304-5 PAYMENT. To the City Supplement, REVISE section "304-5" to "304-6".

SECTION 306 – OPEN TRENCH CONDUIT CONSTRUCTION

306-1 General. To the "GREENBOOK", ADD the following:

It is anticipated the onsite soils will be generally excavatable with conventional, heavy duty trench excavation equipment although areas of very dense to hard well-cemented soils will likely be encountered in the Lindavista Formation and Stadium Conglomerate. These well-cemented soils may require heavy ripping, jackhammering or rock breaking excavation methods.

306-3.7 Imported Backfill. To the "WHITEBOOK", ADD the following:

4. Imported backfill shall be granular, have an expansion index less than 20 (per ASTM D4829) and no particles greater than 3" in maximum dimension.

306-4 Shoring and Bracing. To the "WHITEBOOK", ADD the following:

4. Shoring is the responsibility of the Contractor and shall be designed by a structural engineer licensed in the State of California. Excavated and/or backfill soils should not be stockpiled at the top of temporary excavations (or trenches) or in close proximity (within the area defined by a 45 degree angle from the bottom of the temporary excavation or trench.)

306-7.8.2.1 General. To the City Supplement, item 2, ADD the following:

- a) Specified test pressure for Class 235 pipe shall be 150 psi.
- b) Specified test pressure for Class 305 pipe shall be 200 psi.

306-8.3.2 Installation. To the "GREENBOOK", ADD the following:

Pothole per Section 5-1 and make field measurements needed before submitting shop drawings or ordering pipe, fittings or specials. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

Steel pipe shall be laid so the bell end of pipe faces in direction of laying. Pipe on slopes steeper than 20% shall be laid in uphill direction. Prior to laying pipe, grade trench bottom and prepare to provide uniform bearing throughout entire length of each pipe joint. Excavate suitable bell holes at each joint and scoop out a shallow lateral depression half a pipe length from last pipe laid to allow for easy removal of belt pipe sling and thus avoid any movement of pipe after it is placed on proper line and grade.

The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements
2. Applicable OSHA and Cal OSHA regulations
3. Applicable building, fire, plumbing and mechanical code requirements
4. AWWA C604 Installation of Steel Water Pipe 4 in and Larger
5. AWWA M11 Steel Water Pipe: A Guide for Design and Installation

ADD:

306-8.3.4 Steel Pipe Field Quality Control

Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Steel Pipe Fillet Welds and Lap Welds	Field Welding of Joints on Pipe Interior (Magnetic Particle Test)	AWWA C206 Section 5.2 and AWS D1.1 Upon test completion remove and flush all non NSF61-Compliant Materials from Pipe Interior	All interior steel pipe single-welded joints	Contractor	Contractor
	Field Inspection of Interior Welds	Visual Inspection per AWWA C206 Section 5.1 and Video-Camera Record of Pipe Interior Welding by Independent City-Accepted Inspection Agency. Verify absence of sharp edges, weld spatters, and burrs	All interior steel pipe single-welded joints	Contractor	Contractor
Steel Pipe Butt Welds	Radiograph Inspection of Butt Welds	AWS D1.1	All stainless steel pipe butt welds in pipe 20" or larger	Contractor	Contractor
	Magnetic Particle Test	AWWA C206 Section 5.2 and AWS D1.1 Upon test completion remove and flush all non NSF61-Compliant Materials from Pipe Interior	All steel pipe butt-welded joints not x-ray tested	Contractor	Contractor
	Ultrasonic Test (Alternate to Magnetic Particle Test)	AWWA C206 Section 5.2 and AWS D1.1	All steel pipe butt-welded joints not x-ray tested	Contractor	Contractor
	Field Inspection	Visual Inspection of Pipe Interior Welds per AWWA C206 Section 5.1. Verify absence of sharp edges, weld spatters, and burrs	All steel pipe butt-welded joints	City	City
Installed Steel Pipe	Cement-Mortar Lining of Joints	AWWA C602 Section 5.3 CCTV inspection of interior of finished installation	1 inspection of all steel pipe joints	Contractor	Contractor
	Hydrostatic Test	Section 306-1.4.5	All steel pipe	Contractor	Contractor
	Disinfection	Section 306-1.4.7 and AWWA C651.	All steel potable water pipe	Contractor	Contractor
	Anchorage and Support of Exposed Pipe	Visual inspection of finished installation. Support per UPC Table 3-1 and 3-2	1 inspection	City	City
	Installation & Leakage	Visual inspection of exterior of finished	1 inspection	City	City

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
		installation. No visible leaks			
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	City	Contractor

306-8.3.5 Pipe Protection.

At all times when pipe laying is not in progress, close open end of pipe with tight-fitting cap or plug to prevent entrance of foreign matter. These provisions shall apply during off hours as well as overnight. In no event shall pipeline be used as a drain for removing water which has infiltrated into trench. Contractor shall maintain inside of pipe free from foreign materials and in a clean and sanitary condition until acceptance by CITY'S Representative.

306-8.3.6 Corrosion Protection.

A cathodic protection system shall be provided as shown on the plans and in accordance with Section 16640 Cathodic Protection System. (See attached Technical Specification Sections.)

306-8.9.1 General. To the "GREENBOOK", ADD the following:

Welded steel pipe shall have a test pressure of 225 psi.

306-12.1 General. To the "GREENBOOK", ADD the following:

Backfill should be placed in uniform lifts not exceeding 8 inches in loose thickness.

306-15.1 General. To the "WHITEBOOK", ADD the following:

Payment for the 48" welded steel pipe and fittings will be made at the lump sum price shown in the bid item.

306-15.2 Shoring and Bracing. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. The Bid item for "Trench Shoring" shall include full compensation for furnishing, installing, maintaining, and removing all sheeting, shoring, or bracing for any conditions encountered that require shoring including the preparation of engineered Shoring Plans in accordance with 7-10.4.2.2, "Shoring Plan". No additional payment shall be made.

306-15.5 Valves. To the "WHITEBOOK", item 1, DELETE in its entirety and SUBSTITUTE with the following:

1. The bid item for Valves shall include payment of valve bypass lines and all appurtenances.

SECTION 307 – JACKING AND TUNNELING

307-2 Tunneling Operations. To the “GREENBOOK”, ADD the following

1. Refer to Section 02443, Microtunneling (See the attached Technical Specification. Sections.
2. The San Diego County Water Authority pipeline crossing (66” Trenchless Crossing of 48” SDCWA Pipeline in El Cajon Blvd.) shall be constructed per the following:
 - a. Define the location, depth and configuration of the launching and receiving shafts at the crossing; and the traffic management plans for the proposed construction. Provide details of the proposed design(s), and submit the work plans and design calculations to the City for approval. Existing boring information suggested man made fill and/or soils of the Lindavista formation overlying the Stadium Conglomerate within the tunnel horizon. The Contractor shall assume a mixed face tunneling condition with fill and/or Lindavista soil above the springline and Stadium Conglomerate found at the tunnel springline or below; and a perched groundwater table at the interface. Excavate and install the steel casing for the horizontal pipeline in accordance with the proposed line and grade and within the acceptable construction tolerances. Size the steel casing pipe per clearance envelope as indicated. The excavation and the installation of the steel casing may be performed by:
 - 1) Microtunnel – Per Specification Section 02443 Microtunneling (See the attached Technical Specification Sections.)
 - 2) Pipe Jacking with appropriate mechanical excavation tools or by hand digging with man access inside the pipe jacking pipe – Per Section 307-1 for removal of obstructions.
 - 3) Any other trenchless construction proposed by the Contractor and accepted and approved by the Engineer.
 - 4) Provide pre-excavation support of the overlying aqueduct to maintain no lateral or vertical settlement during construction.
 - 5) Minimum geotechnical instrumentation at each underground crossing shall include one observation well/Piezometer to monitor the groundwater table, three utility settlement monitoring points and five surface settlement markers. Locations for all instrumentation are to be approved by the engineer.
 - 6) Perform at least one confirmation geotechnical exploration boring to at least two excavated diameters below the invert of

the crossing to verify existing ground and groundwater conditions.

- b. The underground construction work shall be performed assuming a "Potential Gassy" ground condition.
3. Submit proposed work plan, construction sequence, schedule, design calculations and details of the work to the Engineer for approval.
4. Install the final carrier pipe per Section 02445 Installation of Carrier Pipe in Steel Casing (See the attached Technical Specification Sections.)
5. All submittals described herein for the two crossings shall be prepared and stamped by a professional engineer registered in the State of California.
6. Perform the shaft and tunneling work per Cal-OSHA requirements and permit conditions of the tunnel classification.

307-2.10 Payment. To the "Greenbook", first paragraph, DELETE and SUBSTITUTE with the following:

The "Trenchless Crossing at El Cajon Blvd" is lump sum and shall compensate the Contractor for the planning, site investigation, design, and construction of a two-pass trenchless excavation and installation of the permanent carrier pipe underneath El Cajon Blvd from the Stationing shown on the plans. The price bid shall include full compensation for dewatering, permeation grouting, excavating, maintaining, backfilling and resurfacing access pits, furnishing and installing pipes and fiber optic conduit and doing whatever else is appurtenant to tunnel construction. Assumptions for site and subsurface conditions, and performance of the required work are described in Section 307, 308 and 02443 Microtunneling.

ADD:

307-2.11 Pipe.

1. Wall Thickness. Plate and sheet thickness shall conform to Section 209-2.1.
2. Joints for tunnel casing pipe shall be interlocking, direct-jacked, non-pressure, T5 by Permalok or approved equal specifically designed for pipe jacking. The joint shall be designed to withstand the anticipated groundwater hydrostatic pressure, slurry and lubricant injection pressures.

SECTION 308 – MICROTUNNELING

308 MICROTUNNELING. To the "Greenbook", DELETE in its entirety and ADD the following:

For tunneling, see Section 307, Jacking and Tunneling and Section 02443, Microtunneling (See the attached Technical Specification Sections.)

SECTION 314 – TRAFFIC STRIPING, CURB AND PAVEMENT MARKINGS, AND PAVEMENT MARKERS

314-4.3.7 Payment. To the "GREENBOOK", ADD the following:

1. The payment for the replacement of existing traffic striping, pavement markings, and pavement markers shall be included in the Bid item for "Striping".

314-4.4.6 Payment. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. No separate payment shall be made for establishing alignment for stripes and layout Work.
2. The payment for the thermoplastic traffic striping of continental crosswalks shall be included in the Bid item for "Continental Crosswalks".
3. The payment for the replacement of existing traffic striping, pavement markings, and pavement markers shall be included in the Bid item for "Striping" and shall also include the payment for new installations of traffic striping, pavement markings, and pavement markers.

314-5.1 General. To the "Greenbook", ADD the following:

Pavement markers shall be replaced in kind unless noted otherwise.

SECTION 600 - ACCESS

600-1 GENERAL. To the "WHITEBOOK", item 5, DELETE in its entirety and SUBSTITUTE with the following:

5. If the City's crews are unable to provide the citizens with the mandated services due to your failure to comply with these specifications, you shall collect trash, recyclables, and yard waste on the City's schedule and deliver to the City's designated locations. If you fail to perform this Work, you shall incur additional costs for the City to reschedule pick up of an area.

SECTION 601- TEMPORARY TRAFFIC CONTROL FOR CONSTRUCTION AND MAINTENANCE WORK ZONES

601-2.1.2 Engineered Traffic Control Plans (TCP). To the "Whitebook", ADD the following:

6. Engineered Traffic Control Plans have been included in the Contract Plans for the majority of the project. The Contractor shall provide and maintain the Traffic Control devices to construct the work. Changes to the Traffic Control Plans requested by the Contractor and Traffic Control shall conform to Sections 601-2 Traffic Control Plan (TCP).

601-6 PAYMENT. To the "Whitebook", Delete in its entirety and SUBSTITUTE with the following:

Payment for all temporary traffic control including any permits shall be included in the lump sum bid item for "Traffic Control".

1. Installing, maintaining, repairing, replacing, and removing the K-rail, excavation and back-fill, drilling holes and grouting threaded rods or dowels when required,

removing threaded rods or dowels and filling drilled holes with mortar, and moving and replacing removable panels as required, complete in place, as shown on the Plans, and in accordance with these specifications and the Special Provisions are included in the Bid item for "Traffic Control".

2. Payments for traffic control Working Drawings, engineered TCP, and Traffic Control for Work and Permits are included in the Bid item for "Traffic Control". This will include, but not limited to, traffic control devices, signs, notices and detours.
3. Payment for Traffic Control Devices and any required signs and notices and detours is included in the lump sum Bid item for the Traffic Control when provided in the Bid proposal. Traffic Control Devices which may be required by the City, not included as separate Bid items, are included in the payment.
4. No separate or additional payment shall be made for the operation, maintenance, repair, or replacement of Temporary traffic Control zone devices.
5. The following Traffic Control Devices will be included in the lump sum Bid item for "Traffic Control":
 - a) Maintaining, repairing, replacing, and removing the Crash cushion modules, complete in place, as shown on the Plans and in accordance with these specifications and the Special Provisions are included in the lump sum Bid item for "Traffic Control".
 - b) Maintaining, repairing, replacing, and removing the flashing arrow boards, complete in place, as shown on the Plans, and in accordance with these specifications and the Special Provisions are included in the lump sum Bid item for "Traffic Control".
 - c) Flashing arrow boards and electronic message signs must be available for use 24 hours per day as required, without any additional payment for time or number of locations unless otherwise required for changed conditions and are included in the lump sum bid item for "Traffic Control".

SECTION 700 – MATERIALS

700-1.5 Fiber Optic Subsystems. To the "WHITEBOOK", ADD the following:

Fiber optic conduit within all open trench sections shall be PVC pipe, Schedule 40, with push-on, gasketed joints rated for electrical use. Fiber optic conduit installed within the casings at the trenchless crossings shall be Schedule 40, Hot-dipped, galvanized steel with threaded ends. Conduit and fittings shall be manufactured in accordance with UL and ANSI standards and shall bear the UL label as applicable. Sweeps shall contain a minimum bend radius of 36". Warning tape shall be installed per Section 700-1.5.1.1. Concrete trench encasement shall be per Section 700-1.5.1.3. Pull boxes shall be precast concrete, rated for H-20 loads and spaced no further than four ¼ bends (360° total bends) or 1,000' apart whichever is less. Cover shall be flush mounted, galvanized, steel checker plate, skid resistant, bolt down, lockable, with the words "Fiber Optic" cast on it. Pullboxes shall be Christy, Brooks or approved equal.

700-9.1 Pedestrian Barricade. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

2. Pedestrian barricades shall be constructed in accordance with the City of San Diego Standard Drawing SDE-103, "Pedestrian Barricade".
3. Curb ramp barricades shall be constructed in accordance with the City of San Diego Standard Drawing SDG-140, "Curb Ramp Barricade".
4. Assembly shall be commercial quality galvanized material.

SECTION 701 – CONSTRUCTION

701-2 PAYMENT. To the "WHITEBOOK", ADD the following:

19. The payment for Curb Ramp Barricades shall be included in the Bid item for each "Curb Ramp Barricade".
20. The Contract Unit Price per foot of fiber optic conduit shall include full compensation for excavating, constructing, installing conduit, pull boxes and fittings, permanent resurfacing and all other work necessary to install the fiber optic conduits.

SECTION 802 – NATIVE HABITAT PROTECTION, INSTALLATION, MAINTENANCE, AND MONITORING

802-2.1 Project Biologist. To the "WHITEBOOK", ADD the following:

5. The Contractor will retain a qualified Project Biologist to perform biological monitoring work for this Contract. You shall coordinate your activities and Schedule with the activities and schedules of the Project Biologist.

SECTION 901 – INSTALLATION AND CONNECTION

901-2.5 Payment. To the "WHITEBOOK", item 3, DELETE in its entirety and SUBSTITUTE with the following:

3. Traffic control, saw cutting the trench area, trench caps, and other spot repairs in the vicinity of the disturbed area at each restored connection shall be included in the square foot Bid item for "Pavement Restoration for Final Connection". Asphalt overlay and slurry seal Work shall be paid for under separate Bid items.

EQUAL OPPORTUNITY CONTRACTING PROGRAM (EOCP) SECTION A – GENERAL REQUIREMENTS

4.1 Nondiscrimination in Contracting Ordinance. To the "WHITEBOOK", subsection 4.1.1, paragraph (2), sentence (1), DELETE in its entirety and SUBSTITUTE with the following:

You shall not discriminate on the basis of race, gender, gender expression, gender identity, religion, national origin, ethnicity, sexual orientation, age, or disability in the solicitation, selection, hiring, or treatment of subcontractors, vendors, or suppliers.

END OF SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

TECHNICALS

TECHNICALS SPECIFICATIONS

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SECTION 02341

PERMEATION GROUTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies minimum requirements for designing, performing, and testing the adequacy of permeation grouting to be performed for
 - 1. Break-in and breakout of the microtunneling operation at the bottom of the shaft excavation;
 - 2. If needed, formation of a curtain grout wall enclosing the shaft excavation.
 - 3. Other underground crossings where controls of ground stability and groundwater inflow are deemed necessary.
- B. The Work shall be performed to:
 - 1. Minimize groundwater seepage or leakage;
 - 2. Improve the ground stability of in-situ materials;
 - 3. Control ground settlement; and
 - 4. Prevent inadvertent returns of drilling fluid from microtunneling operation.
- C. Perform grouting from grout holes installed horizontally, inclined or vertically to obtain the specified minimum grout coverage as specified and as indicated.

1.2 DEFINITIONS

- A. Chemical Grout: A combination of ingredients comprising matrix-forming base materials, reactants, and accelerators or retarders.
- B. Grout Curtain Wall: Installation of a series of intersecting and overlapping grout treatment zones to form a continuous impermeable wall or curtain against the movement of groundwater.
- C. Permeation Grouting: A method of ground treatment to reduce permeability and improve strength and stability of permeable, cohesionless layers within the overburden soils and/or Stadium Conglomerate using chemical grout to fill soil pore spaces without causing fracturing or excessive movement of the ground.

D. Syneresis: Loss of liquid component caused by shrinkage or rearrangement of the structure.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02443, Microtunneling

1.4 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. American Society For Testing and Materials (ASTM):

1. C494, Specification for Chemical Admixtures for Concrete.
2. D4219, Unconfined Compressive Strength Index of Chemically Grouted Soils.
3. D4320, Laboratory Preparation of Chemically Grouted Soil Specimens for Obtaining Design Strength Parameters.

1.5 SUBMITTALS

A. General: Make in accordance with Greenbook/Whitebook/SSP Section 2-5.3.

B. Product Data:

1. Materials specified in Part 2 herein.
2. Manufacturer's mixing and handling requirements, personal safety equipment, first aid measures, and methods for proper storage and disposal of waste materials, include containers.
3. Material Safety Data Sheets (MSDS).

C. Working Drawings and Methods Statements:

1. Grout zone dimensions and locations, if different from what indicated or specified elsewhere in the Contract.
2. Means and methods for grout pipe installation and performing permeation grouting in each application. Identify work and staging areas, patterns, orientations, sequences, depths, utility interference and types of grouting, grout pipes, packers, and methods for performing grouting.
3. Calculations with clearly stated design parameters and assumptions identifying basis of grout design including computations of grout quantities with respect to porosity, strength of the grouted mass, target volumes, reduction in permeability, and refusal and closure criteria for the ground conditions defined in the Geotechnical Report.

4. Proposed time schedule and work hours for performing permeation grouting.
 5. Traffic control plans, including sequencing and duration of detours and lane closures, as specified elsewhere in these specifications.
- D. Grout Mix Designs for the subsurface and groundwater conditions anticipated to be encountered.
- E. Refusal and closure criteria proposed by the Contractor.
- F. Quality Control:
1. Qualifications:
 - a. Grouting subcontractor and supervision
 - b. Design Engineer.
 2. Certifications:
 - a. Certified laboratory test results on three sets of three grouted samples at least 30 days before starting grouting operations documenting that the proposed grout mix meets specified requirements.
 - b. Manufacturer's certificate of compliance with Part 2, material requirements of this specification section.
 - c. Manufacturer's certificate of origin for sodium silicate.
 3. Quality Control Plans:
 - a. Methods for assuring that the targeted area has been fully grouted and that the strength and/or permeability requirements have been achieved.
 - b. Ability to identify the depth to the top of the Stadium Conglomerate within 1 foot accuracy.
 - c. Methods for assuring that permeation grouting do not damage utilities or installed geotechnical instrumentation.
 - d. Detailed drawings to illustrate preventive measures to protect the utilities and structures from damage.
 - e. Methods for determining in-situ testing or sampling for compressive strength.

- f. Spill control plans describing procedures and mitigation measures to prevent and to minimize grout spillage onto ground surface or into the shaft excavation.

4. Records:

- a. Logs of exploratory borings drilled at each grouting location. Results of any field or laboratory testing performed by the Contractor.
- b. Fully dimensioned as-built locations, depths, lengths and orientations of drilled holes and casings.
- c. Daily records of drilling and grouting operations including injection rate, time, location, grout mix, gel time, pressure, rate, volume and packer locations.
- d. Results of the in-situ or laboratory testing of compressive strengths of the grouted materials before and after permeation grouting operation.

5. Notifications:

- a. With 10 days advance notice of performing permeation grouting within public rights-of-way.
- b. Immediately of leakage or damage to structures or facilities during grouting operations.
- c. If Contractor's confirmation soil borings suggested a change condition from contract document.
- d. If any of the contract required grout area is deemed ungroutable.

1.6 QUALITY ASSURANCE

A. Qualifications:

- 1. Design Engineer: California Registered Geotechnical or Civil Engineer.

1.7 DESIGN CRITERIA

- A. The work required herein relies substantially on CONTRACTOR-responsible means and methods for performing permeation grouting. Augment and enhance the minimum design criteria specified herein as required to meet the design and performance requirements specified elsewhere in these specifications.
- B. Confirm subsurface conditions where permeation grouting is indicated or specified by

advancing and logging at least one confirmation borehole at each location. Groundwater, when encountered, is reported under an artesian conditions to within a few feet below surface grade. Confirmation boring is not required when an existing or proposed logged, boring are located within 10 feet from the permeation grout zone.

C. Contract Required Pre-excavation Permeation Grouting

1. Break-in and break-out locations at microtunnel pits and shafts where indicated. The minimum dimensions of the grout zone shall be as shown or as specified;
2. If needed, continuous grout curtain wall enclosing the launching and receiving shafts to minimize the groundwater inflow at the interface between the overlying soils and the Stadium Conglomerate. The dimensions of the grout curtain wall shall be as indicated.
3. Along the entire length of other underground crossings when groundwater is found at the soils and Stadium Conglomerate interface and within the excavation profile.

D. Seepage of water through shaft break-in and break-out location for launching and receiving of microtunnel boring machine (MTBM) - As specified in Section 02443.

E. Perform permeation grouting in areas specified in Part 1.1.A to the following criteria:

1. Hole spacing: 5-ft (maximum; horizontal or vertical spacing)
2. Maximum injection pressure: 100 percent of the minimum vertical or horizontal in-situ stresses;
3. Minimum design criteria based on injection into standard medium-dense Ottawa sand (Ottawa 20-30):
 - a. Unconfined compressive strength: 50 to 100 psi
 - b. Maximum permeability: 1×10^{-5} cm/sec
 - c. Gel time: Between 20 minutes and 50 minutes.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store chemical grouts and other materials to be used for ground treatment according to manufacturer's recommendations and used in order received. Do not use materials beyond expiration date.
- B. Deliver sodium silicate in sealed containers or a certified tank truck, and accompanied by the supplier's certificate of origin. Deliver reactant materials in sealed containers accompanied by the supplier's certificate of origin.

- C. Store chemicals in metal tanks, suitably protected from accidental discharge.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Materials shall be non-toxic, non-corrosive, and non-flammable.
- B. Chemical Grout:
 - 1. Design mix comprising a liquid base, reactant, water, accelerator, and other approved admixtures as required.
 - 2. Liquid Base: Sodium silicate with a specific gravity between 1.4 and 1.5, and a silicate-to-soda ratio between 3.20 and 3.35.
 - 3. Reactant: Organic base type which, when properly mixed with other grout components, provides a permanent, irreversible gel with controllable gel times. The resulting gels shall exhibit less than 15 percent syneresis in 30 days, and not exhibit objectionable odors such as ammonia. Sodium bicarbonate, sodium aluminates and other reactants that produce a temporary grout are prohibited.
 - 4. Water: Potable and free of impurities affecting grout gelling characteristics and strength development of the grouted soil.
 - 5. Accelerator: Technical grade, water-soluble calcium chloride or other metal salt, containing a minimum amount of insoluble materials.
 - 6. Grout – Nontoxic and nonflammable during and after grouting.
- C. Grout Pipe
 - 1. Provide re-groutable sleeve-port type PVC grout pipes with grout ports at maximum 2 feet centers covered by expandable rubber sleeves
- D. Backfill Grout
 - 1. Use bentonite cement grout for backfilling all exploratory holes and PVC grout pipes left in place. The 28-day compressive strength shall be 50 to 100 psi.

2.2 EQUIPMENT

- A. Chemical Grouting Equipment:
 - 1. General: Continuous mixing type, capable of supplying, proportioning, mixing and pumping the grout of the type specified. Do not use batch- type systems.

2. Meters:
 - a. Equip plant with automatic, real-time display, positive displacement meters that accurately measure and record the volume of each component pumped. Locate meters at the injection point and in each material line ahead of mixer.
 - b. Meter accuracy shall be within 0.25 gpm, independent of fluid viscosity.
 3. Storage tanks:
 - a. Of such capacity as to supply sufficient grouting materials to maintain production for at least 1 day so as to not interrupt the work if chemical delivery delays occur.
 - b. Provide preventive measures against accidental spillage of the grout products into the environment.
 4. Mixers and Pumps:
 - a. Capable of developing at least 300 psi at pumping rates not to exceed 15 gpm.
 - b. Capable of varying the pumping rate while maintaining constant component ratios.
 - c. Equip with piping or hoses of adequate capacity to carry the base grout and reactant solutions separately to the point of mixing. Combine base grout and reactant solutions using a 'Y' fitting equipped with a check valve and a baffling chamber. Provide a readily accessible sampling valve after the baffling chamber. Equip lines with a water flushing connection or valve placed behind the 'Y' to facilitate flushing the grout from the mixing line and baffle between grouting sessions.
 - d. Equip with an automatic pressure shutoff device to protect against overpressuring in the formation and in the equipment.
- B. Quality Control Equipment: Provide all equipment and materials required to perform quality control sampling and testing as specified herein.

PART 3 - EXECUTION

3.1 GENERAL

- A. Abandon grout holes that are lost or damaged due to mechanical failure of the equipment, inadequacy of grout supply, or improper injection procedure. Backfill such holes using approved methods and replace.

3.2 PREPARATION

- A. Exploratory Soil Borings:
 - 1. Locate a minimum 5 feet and a maximum of 10 feet outside the excavated width of the MTBM alignment.
 - 2. Backfill all exploratory borings prior to permeation grouting operation.

3.3 DRILLING

- A. Adopt drilling techniques and of sufficient size and capacity to advance the grout pipe installation to the required depth and reach in the Conglomerate. For horizontal grout pipe installation, the borehole shall be cased during installation to prevent cave in.
- B. Orient grout pipes as required to obtain the specified grout coverage between adjacent grout pipes and to avoid obstructions.
- C. After installing grout pipe, encase the sleeve-port grout pipes in a continuous brittle mortar sheath. Use an internal double packer to inject grout at the required sleeve-port for both rock and soil grouting.

3.4 GROUTING

- A. Chemical Grouting:
 - 1. Conduct surface pressure test of Sleeve Port Grout Tube (SPGT) from manifold to injection point to determine system pressure loss. The pressure measured shall be used to estimate appropriate grouting pressures for production grouting.
 - 2. Using double packers, inject chemical grout into the selected zones through alternate ports in the sleeve pipes. Temporary high injection pressures not exceeding one minute in duration will be permitted to crack open sleeve-ports.
 - 3. Continue to inject grout until the specified refusal criteria have been met.
 - 4. Repeat steps 2 and 3 for the remaining grout ports in the sleeve pipes.

B. Monitoring:

1. Closely monitor the rate of grout take during grout injection. Ascertain the cause of sudden drops in grout injection pressures following initial start-up pressure adjustments. Continuously monitor adjacent paved and unpaved areas, storm drains and other utilities for grout leakage. In the event that grout leaks are observed, temporarily terminate injection and plug leaks before resuming grouting.
2. If excessive grout take is experienced that is not attributable to leakage, change injection pressure, pumping rates, gel or setting times, or grout composition, subject to the acceptance of the ENGINEER, to reduce grout use to acceptable levels.

3.5 CLEANUP AND SITE RESTORATION

- A. Backfill grout holes immediately upon acceptable completion of grouting at that hole.
- B. Remove grout pipe to a depth of 2 feet below finished grade or surface. Grout pipe below 2 feet threshold shall be backfilled with grout. Restore utilities to the existing conditions.
- C. Horizontal grout pipe can be left in place or to be removed by the MTBM excavation.
- D. Restore street pavement and sidewalks in accordance with SSPWC (Standard Specifications For Public Works Construction).

3.6 FIELD QUALITY CONTROL

- A. The CONTRACTOR shall design a field quality control program to demonstrate acceptable improvements in the ground characteristics before and after grouting to determine its effectiveness. The program shall include field or laboratory testing to be performed to verify the presence, strengths and permeability of the grouted soil masses. The Contractor shall perform additional grouting if any of the tested parameters are not in compliance with the performance criteria described herein.
- B. As a minimum, the program shall include the following items:
 1. Equipment: Check plant meter(s) accuracy at least twice daily.
 2. Laboratory tests:
 - a. Prepare 3 Ottawa sand samples for each 5,000 gallons of chemical grout pumped and sample in accordance with ASTM D4219.
 - b. Obtain samples of grout used for chemical grouting for gel time checks at the rate of one sample for every half-hour of pumping or for every 500 gallons of grout, whichever is more frequent. Label gel samples and store until the

completion of the project.

3. Field Tests:

- a. For break-in or breakout - Advance one (1) demonstration boring within the grout zone from each pit or shaft location. Type of tests to be performed
 - (1) Visual: Verify the presence of grout by chemical method. Apply Phenophalin to soil samples recovered by in-situ method at different locations of the grout zone.
 - (2) Strength: Perform continuous SPT (Standard Penetration Test) sampling and testing in the grouted zone. SPT less than 10 bpf shall indicate an insufficient grouting operation.
 - (3) Permeability: Perform a rising or falling head tests in a minimum 3-inch diameter bore hole extended two-third the full thickness of the ground zone to determine the in-situ permeability. For horizontal grout hole, estimate the field permeability by monitoring the groundwater leakage through the borehole opening.

- b. For grout curtain wall - Advance two (2) demonstration borings inside the grout curtain wall at each shaft location and test for tightness of the enclosure.
 - (1) Leakage Test: Perform a rising head test in a minimum 3- inch diameter cased bore hole advanced 1-ft into the Stadium Conglomerate inside the grout curtain ring and test for rate of groundwater re-charge. Estimated field permeability shall be less than 10^{-4} cm/sec.

- c. Exact locations of these borings are to be determined by the Engineer in the field.

****END OF SECTION****

SECTION 02441

CONTACT GROUTING

PART 1 -- GENERAL

1.1 SCOPE OF WORK

- A. This section specifies requirements for designing, furnishing, and injecting contact grout for applications as specified and as indicated.

1.2 RELATED SECTIONS

- A. Section 02443 Microtunneling

1.3 REFERENCE CODES AND STANDARDS

- A. Unless otherwise indicated, the current editions of the following specifications and standards apply to the Work of this Section.
- B. American Society for Testing and Materials (ASTM):
 - 1. C31, Practice for Making and Curing Concrete Test Specimens in the Field
 - 2. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 3. C109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-inch or 50-mm cube specimens)
 - 4. C144, Specification for Aggregate for Masonry Mortar
 - 5. C150, Specification for Portland Cement
 - 6. C937, Standard Specification for Grout Fluidizer for Preplaced Aggregate Concrete

1.4 DEFINITIONS

- A. See Section 02443 Microtunneling.

1.5 DESIGN REQUIREMENTS

- A. Water-cement ratio of the grout mix shall be expressed in cubic feet of water per cubic foot of cement (94 pound bag). The water-cement ratio by volume shall be varied as needed to fill the voids outside the jacking pipe. The range of water-cement ratios shall be between 1:1 and 2:1 by volume.
- B. Grout shall consist of Portland cement, not more than 2 percent bentonite by weight of

cement, fluidizer as necessary, and water in the proportions specified herein or acceptable to the ENGINEER. Sand may be added to the grout mix in instances of very high grout takes as approved by the ENGINEER, but in no case shall the grout mix contain less than six sacks of cement per cubic yard of grout. The addition of sand may require the addition of water or fluidizer to the grout mix.

1.6 SUBMITTALS

- A. Work plan shall include contact grouting methods, equipment, procedure, sequence, injection pressure and provisions for each applications:
1. Details of grout mix proportions, admixtures, including manufacturer's literature, and laboratory test data verifying the strength and set time of the proposed grout mix.
 2. Design and layout of the contact grout port locations, if different from the lubrication ports. State "the same" if the lubrication and grout ports are the same.
 3. Injection pressure calculations denoting maximum injection pressure and factor of safety.
 4. Daily logs listing by grout port, volume pumped, maximum pressure, grout mixture proportions, and crew.
 5. MSDS (Material Safety Data Sheet) for all materials.
 6. Notify the ENGINEER at least one working day in advance of starting contact grouting operations.
 7. Shop drawing of one-way grout injection or lubrication valve.
 8. Grout strength test results within one working day after each test.

1.7 QUALITY ASSURANCE

- A. Make four samples of each proposed grout mix and determine 24-hour, 7-day, and 28- day strengths in accordance with ASTM C39 or C109.
- B. Grout Strength Tests:
1. Prepare and test samples for 24-hour, 7-day, and 28-day compressive strength tests according to ASTM C39 for cylinders or ASTM C109 for cubes, except as otherwise specified herein.
 2. Grout samples shall be taken from the nozzle of the grout injection line. Provide at least one set of four (4) samples for each 100 cubic feet of grout injected, but not less than one set from each batch.
 3. Grout shall have a minimum unconfined compressive strength of 100 pounds per

square inch (psi) in 24 hours, 500 psi in 7 days, and 2,000 psi in 28 days.

- C. CONTRACTOR's engineer shall be a Professional Engineer licensed by the State of California.
- D. Certificate, dated within the last six months, from an independent laboratory that the calibration gauge is accurate to 1 psi.
- E. Volumetric meters shall be calibrated in cubic feet to the nearest 0.1 of a cubic foot.
- F. Monitor ground and utility movement per requirements in Section 02496 Geotechnical Instrumentation.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. Cement: Cement shall be Type V Portland cement conforming to ASTM C150.
- B. Bentonite: Bentonite shall be a commercially processed powdered bentonite, Wyoming type, such as Imacco-gel, Black Hills, or equal.
- C. Sand: Sand to conform to ASTM C144; except:
 - 1. Fineness modulus: Between 1.5 and 2.0 and
 - 2. The following grading requirements:

Sieve Sizes	Percentage Passing by Weight
No.8	100
No. 16	95 - 100
No. 30	60 - 85
No. 50	20 - 50
No. 100	10 - 30
No. 200	0 - 5

- D. Fluidizer: Fluidizers shall hold the solid constituents of the grout in colloidal suspension, be compatible with the cement and water used in the grouting work, contain an expansive shrinkage compensator, and comply with the requirements of ASTM C937. Submit product literature and data for acceptance, if planned to be used.
- E. Water: Water shall be potable.

2.2 EQUIPMENT

- A. Equipment for mixing and injecting grout shall be adequate to mix and agitate the grout to a uniform consistency and force it into the grout port in a continuous flow at the desired pressure.

- B. The grouting equipment shall be provided with:
 - 1. A volumetric meter at the point of injection.
 - 2. One-way valves.
 - 3. Two pressure gauges shall be provided, one at the grout pump and one at the grout port.
 - 4. Grouting hoses shall have an inside diameter not less than 1.5 inches and no greater than 2 inches and capable of withstanding the maximum water and grout pressures to be used with adequate factors of safety.
 - 5. Injection system with a grout re-circulation hose.
 - 6. A pump that provides constant pressure at variable delivery volumes.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Commence contact grouting promptly within 24 hours following completion of the microtunneling drive.
- B. Inject grout through the grout injection or lubrication valves in such a manner as to completely fill all voids outside the steel casing.
- C. Grout pressure shall be monitored, controlled, and recorded so as to avoid damaging the pipe, and to avoid movement of the surrounding ground, utilities and improvements.
- D. A hookup shall be made to every grout or lubrication port.
- E. Re-circulate grout mixes when any new mix is batched or after adding water, fluidizer, or sand to mix. Re-circulate mix for sufficient time so grout is consistent with batch prior to pumping grout into grout hole.

3.2 INJECTION OF GROUT

- A. All materials shall be free of lumps when put into the mixer and the grout mix shall be constantly agitated. Grout shall flow unimpeded.
- B. Grout not injected 90 minutes after mixing shall not be used for contact grouting.
- C. Grouting shall progress sequentially in a constant up gradient direction from one grout port to the next grout port in the sequence indicated in the approved submittals.
- D. Contact grouting pressure at the injection point shall not be more than 0.6 psi per foot depth of soil overburden or maximum 15 psi, unless otherwise proposed by the CONTRACTOR, with the ENGINEER's concurrence.

- E. Grouting shall be considered completed when less than 1.0 cubic foot of grout of the accepted mix and consistency can be pumped in 5 minutes under the submitted maximum injection pressure, or grout flows from the shaft or portal at the same rate as it is pump.
 - F. Grout lines shall be flushed with water upon the completion of grouting or the end of shift, whichever occurs first. Flushed grout shall not be injected into the annular space.
 - G. All ports shall be plugged after grouting has been completed and grout has set.
- 3.3 FIELD QUALITY CONTROL

- A. Equipment for mixing and injecting grout shall be adequate to mix and agitate the grout to a uniform consistency and force it into the grout port in a continuous flow at the desired pressure.
- B. Grout shall be mixed to a uniform consistency and agitated until used or disposed.
- C. The accuracy of the pressure gauges shall be checked at the start of each shift with an accurately calibrated pressure gauge.
- D. Measure and record contact grout mix proportion, injection pressure and quantities to sufficient accuracy so as to prevent excessively high pressure to cause an inadvertent return or heave.

3.4 CLEAN UP

- A. Clean grout from inside the jacking pipe and remove and properly dispose of all waste grout at the earlier of the end of each shift or the completion of grouting. Check making sure all protrusion into the steel casing shall be removed to avoid interference with the subsequent carrier pipe installation.

****END OF SECTION****

SECTION 02443

MICROTUNNELING

PART 1 -- GENERAL

1.1 SCOPE OF WORK

- A. This Section specifies minimum design and performance requirements for the construction of the Mid City pipeline by two-pass microtunneling method, where a steel casing pipe will be installed first and the final carrier pipe to be inserted later. This section covers the requirements for microtunneling; whereas additional requirements for the installation of and backfill around the carrier pipe are specified in Section 02445.

1.2 RELATED NON-SSPWC SECTIONS

- A. Section 02441 Contact Grouting
- B. Section 02445 Installation of Carrier Pipe in Steel Casing

1.3 REFERENCE CODES AND STANDARDS

- A. Unless otherwise indicated, the current editions of the following specifications and standards apply to the Work of this Section.
- B. American Society for Testing and Materials (ASTM):
 - 1. A139, Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
 - 2. D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 3. D6910, Standard Test Method for Marsh Funnel Viscosity of Clay Construction Slurries
- C. American Petroleum Institute (API): 2B, Specification for the Fabrication of Structural Steel Pipe.
- D. NSF/American National Standards Institute (ANSI) Standard 60, Drinking Water Treatment Chemicals.
- E. Occupational Safety and Health Administration (OSHA) Regulations and Standards for Underground Construction: 29 CFR Part 1926
- F. Cal/OSHA: State of California Administrative Code, Title 8

- G. "Greenbook", Standard Specifications for Public Works Construction (SSPWC), and per latest revisions by City of San Diego' White Book.
- H. Caltrans Encroachment Permits, "Guidelines and Specifications for Trenchless Technology Projects".
- I. American Society of Civil Engineers (ASCE) – Standard Design and Construction Guidelines for Microtunneling (Draft), February 24, 2014
- J. 46 CFR Chapter I, 54.01-17 - Pressure Vessel Human Occupancy (PVHO).
- K. 29 CFR Chapter XVII, 1926.803 - Compressed Air.
- L. American Society of Mechanical Engineer, PVHO-1, Safety Standard for Pressure Vessels for Human Occupancy
- M. American Society of Mechanical Engineer, PVHO-2, Safety Standard for Pressure Vessels for Human Occupancy: In-Service Guidelines for PVHO Acrylic Windows

1.4 DEFINITIONS

A. General:

1. Annular Space: The gap calculated by the radial distance between the outside radius of the jacking pipe and the excavated radius of the outermost gauge cutter.
2. Boulder Volume Ratio (BVR): Volume of boulders sized (larger than 12-inch in principle dimension) clasts as a percentage of the total muck volume
3. Carrier Pipe: The final product pipe for conveyance of water.
4. Casing Pipe: A jacking pipe, made of steel, used to support a tunnel and within which the carrier pipe is later constructed. The casing pipe provides initial ground support and transfers the forward thrust of the jacks through the pipe string to the face.
5. Cobbles Volume Ratio (CVR): Volume of cobbles sized (between 3-inch and 12-inch in principle dimension) clasts as a percentage of the total muck volume
6. Compression Ring/Packer: A ring fitted between the end bearing area of the carrier pipe joint to help distribute the jacking forces more uniformly over the entire bearing surface. The compression ring compensates for steering, misalignment, and pipe end irregularities during the jacking process. Compression rings are also referred to as packers. Compression rings are not used with steel casing pipe.
7. Contact Grouting: Grouting outside of the jacking pipe to fill voids and assure that intimate contact for load transfer between the jacking pipe and the native host material has been achieved.

8. Controls: Part of the microtunneling control system that synchronizes excavation, pressure balance, removal of excavated material, and jacking of pipe to balance forward movement with the removal of excavated materials so that ground settlement or heave is minimized or eliminated.
9. Cutterhead: Any rotating tool or system of tools that excavates materials.
10. Cutterhead Opening Ratio (COR): Percentage of open area on the cutterhead in relationship with the total excavated cross sectional area.
11. Earth Pressure Balance Machine: Type of microtunneling or tunneling machine in which the excavated material at the face is controlled to provide the counter balancing earth pressure to minimize or eliminate heave and subsidence. The counter balancing force is typically maintained between the active and passive earth pressures.
12. Emergency Recovery Shaft: A vertical excavation required for the removal of an obstruction or for removal or repair of the trenchless construction equipment. The location of an emergency shaft is determined by construction necessity and will not have permanent civil structures constructed in the shaft.
13. Face: The location where excavation is taking place.
14. Hook up – Connection to a single lubricant or grout port along the jacking pipe.
15. Hyperbaric Intervention – Hyperbaric intervention is to prepare a pressurized atmosphere (with breathable compressed air) at the MTBM excavation chamber where compressed air is used as a mean of ground support, and to allow man entry inside where maintenance tasks can be performed.
16. Inadvertent Return: The loss of drilling fluid, including slurry and lubrication, from the slurry or lubrication system. An inadvertent return occurs with fluids reaching the ground surface, a body of water, or a utility. A common form of inadvertent return, where the fluid reaches the surface or waterway, is commonly called a “Frac-out.”
17. Intermediate Jacking Station(s) (IJS): A fabricated steel cylinder fitted with hydraulic jacks, which is incorporated into a pipeline between two jacked pipe segments. Its function is to provide additional thrust to overcome resistive skin friction of the MTBM and pipeline and to distribute the jacking forces over the pipe string on long drives.
18. Jacking Frame: A structural component, fitted with hydraulic cylinders that is used to push the MTBM and casing pipe into the ground. The jacking frame distributes the thrust load to the casing pipe and the reaction load to the shaft wall or thrust block.
19. Jacking Pipe: A specialty pipe that is engineered and manufactured with a smooth outer wall and watertight joints. The pipe is specifically designed to be jacked through the ground. The jacking pipe is either a casing pipe or a carrier pipe.

20. Jacking/Launching/Entrance Shaft/Pit: A vertical excavation from which trenchless technology equipment and pipe are launched and driven.
21. Jacking Shield: A fabricated steel cylinder from within which tunnel excavation is performed.
22. Laser: A device commonly incorporated into the navigation system used to maintain alignment and grade during tunnel construction.
23. Lubricant (Lubrication): A fluid, normally bentonite and/or polymers suitable for the particular ground conditions, used on the exterior of the jacking pipe to fill the annular space to reduce skin friction.
24. Lubrication Port: A port located in a jacking pipe segment, fitted with a one-way valve, for injection of lubrication material into the annular space. After microtunneling installation of the jacking pipe, lubrication ports are used for contact grouting if required.
25. Maximum Allowable Jacking Force: The largest jacking load that the jacking pipe can accept allowing for an appropriate factor of safety.
26. Maximum Anticipated Jacking Force: The largest theoretical jacking force required to advance the pipe string and Microtunnel Boring Machine (MTBM) from one location to another.
27. Microtunneling: A remote controlled and guided pipe-jacking process that provides balancing of the earth pressure in addition to applying hydrostatic counterbalancing pressure to the face. The pipe string provides continuous support to tunnel.
28. Microtunnel Boring Machine (MTBM): A remote controlled, steerable, instrumentation guided tunnel boring machine consisting of an articulated boring machine shield and a rotating cutter head. Excavated muck is removed by slurry. Personnel entry into the MTBM is not required for the routine operation of the MTBM.
29. "N" Value: Penetration resistance as measured from the standard penetration test (SPT). The SPT consists of counting the number of blows of a 140-pound hammer freely falling 30 inches while driving a 2-inch outside diameter (OD) split-spoon sampler a minimum of 18 inches into the soil. The number of blows is recorded for each 6 inches of penetration for an 18-inch drive. The first 6 inches of penetration are discounted and the number of hammer blows required to drive the sample over the 6 to 18-inch range of sampler penetration is the standard penetration resistance or "N" value. Low "N" value is defined herein with SPT equals 5 or below.
30. Navigation System: System that locates and records the actual, real time position of the MTBM relative to the design location. The navigation system shall be capable to maintain the line and grade tolerances as specified along the complete jacking distance required.

31. Obstruction: Obstruction is an object not expected to be encountered and located fully or partially in the direct path of the MTBM that meets all requirements specified in this Section, thereby preventing the forward movement of the MTBM after all diligent efforts to advance the MTBM have failed due to one of the following:
 - a. Hard clast (boulder) with a principal dimension greater than 1/3 of the excavated MTBM diameter, or
 - b. More than two (2) minimum 16-inch diameter boulders with an unconfined compressive strength (UCS) greater than 70,000 psi; or
 - c. Hard, cemented sandy matrix with a thickness greater than 2-ft at the face of the MTBM with an unconfined compressive strength (UCS) greater than 16,000 psi or
 - d. Large tree trunk, timber or woods debris in the excavated muck that completely block the MTBM slurry removal system or
 - e. Excavated muck consists of a mixture of gravel, cobbles and boulders debris, with Boulder Volume Ratio (BVR) and Cobbles Volume Ratio (CVR) ratio above the baseline percentage described herein, being collected in the MTBM chamber stalling the rotation of the MTBM cutterhead.
32. Overcut: The radial distance between the excavated perimeter of the outermost gauge cutter and the outside radius of the MTBM.
33. Pipe Jacking: Construction of a pipeline by hydraulically jacking consecutive sections of jacking pipe through the ground behind a shield
34. Pipe String: The succession of joined individual pipes being used to advance the excavation equipment and support the tunnel.
35. Pit: A vertical opening where the depth of the excavation is less than the long dimensions of the excavation. The word "pit" and "shaft" are used interchangeably in this specification.
36. Principal Dimension: The largest of an object's three mutually orthogonal measurements.
37. Receiving/Exit Shaft/Pit: A vertical excavation from which trenchless technology equipment is received and removed.
38. Shaft: A vertical opening where the depth of the excavation is more than the long dimensions of the excavation. The word "pit" and "shaft" are used interchangeably in this specification.
39. Slurry: A water/bentonite/polymer fluid which is used for the transportation of excavated materials and to balance the naturally occurring hydrostatic pressure during microtunneling. Slurry is a fluid designed with specific engineering properties including density, viscosity, and gel strength.

40. Slurry Chamber: An area/chamber located behind the cutter head of a slurry microtunneling machine where excavated material is mixed with slurry in the chamber and transported to the surface by pumping.
41. Slurry Line: A series of hoses or pipes that transports spoils and slurry from the face of a slurry Microtunneling machine to the surface.
42. Slurry Pressure Balance: An operational mode of the microtunneling system which uses a slurry fluid to balance ground and water pressures at the face of the tunnel and improve face stability.
43. Slurry Separation: A process where excavated material is separated from slurry so that the slurry may be reused.
44. Specials: The pipe sections immediately ahead of and behind an intermediate jacking stations (IJS) that have been specifically manufactured to physically accommodate the IJS.
45. Spoil(s): Excavated material.
46. Sump Pump: A pump placed in a shallow well used to collect and remove water incidental to the construction process, shaft leakage, and to prevent the excavation equipment from flooding.
47. Thrust Block: An engineered structure located between the jacking frame and the shaft wall which distributes the jacking force developed by the hydraulic jacking frame over a large surface area.
48. Thrust Ring: A fabricated ring that is mounted on the face of the jacking frame. It is intended to transfer the jacking load from the jacking frame to the thrust bearing area of the jacking pipe.
49. Trenchless Technology Equipment: Equipment used to install the pipe from the point of origin to the destination without the use of an open trench cut.
50. Trigger Level: Action level or maximum allowable level for movement.
51. Water Jetting: Cleansing mechanism of the cutterhead where high-pressure water is sprayed from nozzles in the cutterhead to help remove soils classified as clays per ASTM D2487

1.5 DESIGN REQUIREMENTS

A. Cal-OSHA Classification

1. The City has obtained from Cal/OSHA an underground classification as "Potential Gassy" for the underground work to be performed under this section:
 - a. All access shaft excavation; and
 - b. All trenchless excavation with an excavated diameter 30 inches or larger.

Refer to Cal-OSHA permit conditions described elsewhere in the Contract Document.

2. All underground equipment shall conform with Class I Division 2 as defined by OSHA Standards, 29 CFR Part 1926, Subpart K, unless more stringent requirements are imposed by Cal/OSHA.

B. Jacking Systems:

1. The installed jacking system capacity, including the use of intermediate jacking stations when applicable, shall exceed the maximum anticipated jacking force by at least 30 percent.
2. If needed, IJS shall be designed and capable of withstanding the maximum anticipated jacking force with a minimum factor of safety of 2.0. Fully assembled intermediate jacking stations and two pipe specials for each IJS shall be required and mobilized on site for each microtunneling drive prior to commencing the drive if any one of the following conditions is met:
 - a. When the maximum anticipated jacking force exceeds 80 percent of the maximum allowable jacking force of the jacking pipe.
 - b. When the main jacks do not exceed the maximum anticipated jacking force by at least 30 percent.
 - c. Minimum Requirements
 - i) Stroke distance = 24 inches minimum
 - d. The Intermediate jacking stations shall be collapsible at the end of the jacking operation to allow closure of the casing pipe specials for the formation of the watertight joint.

C. Slurry:

1. The CONTRACTOR shall not use water-soil only as the drilling fluid that relies on natural fines generated during the MTBM excavation to form the slurry. Include use of bentonite and/or additives to provide a minimum viscosity of 55 second per quart per ASTM D6910.
2. Design the slurry system to facilitate the flow of excavated mucks from the heading to the separation system, to reduce the cutting torque and the wear and tear of the equipment.
3. Design the slurry system to handle the use of polymer and/or bentonite additive in the slurry that is applicable for the ground and groundwater conditions.

- D. Lubrication Systems: Lubrication shall be injected continuously and automatically at the tail of the MTBM and at regular spacing along the entire pipe string during the tunneling operation to ensure a complete distribution of lubricant coating the jacking pipe.

1. Lubrication ports shall be installed at a maximum spacing of 10 feet and positioned at 12 o'clock, 4 o'clock, and 8 o'clock, on an alternating pattern along the entire length of the pipe string.
2. Injection pressure and quantity of material to be discharged through each of the lubrication ports shall be independently controlled and monitored by the MTBM operator.
3. Lubrication and contact grout ports and plugs shall be designed for
 - E. Maximum injection pressures during construction;
 - F. Maximum groundwater pressure summarized in the Geotechnical Report.
 - G. Maximum operating internal pressure of the carrier pipe at the crossing.

E. Entrance and Exit Seals

1. Perform ground treatment at break in and break out zones as indicated and as specified herein.
2. Seals shall be capable of resisting external hydrostatic pressure plus the full pressure exerted by the slurry and lubricant systems of the microtunneling equipment. External hydrostatic pressure shall be based on the design groundwater table indicated in the Geotechnical Report.
3. Use entrance and exit seals that are specially made for the excavated dimensions of the MTBM. Provide adequate adjustments for machine misalignment.
4. Mount exit seal in the receiving shaft only after the Contractor can verify by field measurement the actual position of the incoming MTBM equipment.
5. To control water leakage through the seal assemblies:
 - a. Use fast setting grout to stop any remaining leakage
 - b. Use lubricant injection nozzles mounted on the seals

1.6 Project Baseline Conditions

The tunneling conditions described herein represent the subsurface conditions and ground behavior based on the construction means and methods anticipated. These conditions are established by considering available geologic and geotechnical data, together with past construction experience and anticipated construction methods, interpretation of the data obtained from various sources, including: geologic maps; hollow stem auger, rotary, sonic core and large diameter borings; other borings conducted for nearby projects; geophysical surveys; and in-situ and laboratory tests, as well as the consideration of information from previous construction projects completed locally in similar geologic conditions.

While actual conditions encountered in the field are expected to be within the range of

conditions described, the locations where specific ground and groundwater conditions are encountered may vary. The ground behavior will also depend on the construction sequence and methods employed, as well as the Contractor's equipment, experience and workmanship. The baseline conditions described herein assumes that the construction methods and level of workmanship will be consistent with those that can reasonably be expected from a qualified contractor.

- A. Tunnel horizon is anticipated to encounter the Stadium Conglomerate. Confirm the top of conglomerate with additional logged borings.
- B. The Stadium Conglomerate generally consists of yellow-brown, brown and orange brown, massive cobble conglomerate with hard, rounded clasts in a predominantly sandy matrix. The clasts are generally 4 to 6 inches in diameter, with some clasts up to 16 inches in maximum principal dimension. For baseline conditions, the average unconfined compressive strength of the clasts shall be assumed to be 29,000 psi, with 2 separate 16-inch diameter boulders with compressive strength up to 70,000 psi.
- C. The matrix in between the clasts consists of slightly clayey and/or silty fine to medium sand matrix. There are occasional interbedded lenses of sandstone in the cobble conglomerate. The sandstone interbeds are not laterally continuous and tend to consist of unpredictable, roughly horizon lenses of sandstone. The consistency of the sandy matrix varies from friable (running) to very strongly cemented (with carbonate cement).
- D. The presence of sandstone interbeds and their strength cannot be predicted and are subject to changes vertically and laterally. For baseline conditions, the average unconfined compressive strength of the sandy matrix shall be assumed to vary from 150 psi to 16,000 psi, average 5,000 psi (from testing data available from other projects in the area).
- E. When the conglomerate matrix is very weak, cobble and boulder clasts are not firmly held in place by the matrix and it is expected that the clasts will fall from the tunnel roof, sidewalls and face if not supported. The MTBM cutterhead shall be designed with minimum openings and sufficient torque to allow proper breakage of the clasts at the front of the machine before removal by the slurry system inside the slurry chamber. When the conglomerate matrix is very strong, the MTBM shall be designed with sufficient forward thrust capacity to break up the formation.
- F. For baseline conditions, the Contractor shall assume the following principal clast size dimensions and distributions (from gradation curves taken on Mid City project and other projects in the area)
 - o 3" - 6" material - 12% of volume
 - o 6" to 12" material - 8% of volume
 - o >12" material - 1% of volume
 - o Maximum 16"
- G. BVR = 1 percent and CVR = 20 percent

1.7 Performance requirements

A. Launching and receiving of MTBM:

1. Stabilize ground so that no more than 3.0 cubic feet of ground enters the shaft at the break-in and break-out locations.
2. Groundwater entering the shaft break-in and break-out locations shall not exceed 5.0 gallons per minute (gpm).
3. Prevent MTBM deviating from acceptable line and grade during launching.

B. MTBM Operation

1. During MTBM operation and shutdown, the face pressure at the heading shall be maintained a minimum of 3 psi above the existing perched or groundwater table and the active earth pressure at the invert of the proposed tunnel.

C. Line and grade:

1. The construction tolerances of the MTBM and the directly jacked casing pipe and carrier pipe shall be
 - a. Horizontal Alignment – within 0.025 percent of the total drive distance and not more than 3 inches; and
 - b. Vertical Alignment – within 0.015 percent of the total drive distance and not more than 2 inches.
 - c. No ponding of water or reversed grade shall be permitted between shafts.
2. When the excavation is off line or grade, return to the design line and/or grade over the remaining portion of the drive and at a rate of not more than
 - a. 1 inch per 25 feet
 - b. Maximum allowable angular displacement at the casing and carrier pipe joints.
 3. Casing pipe shall be constructed to permit carrier pipe installation in conformance with Section 02445.

D. Settlement or Heave: Limit settlement or heave to below the Action Levels indicated in Table 1:

Table 1 – Trigger Levels for Settlement or Heave

Facility	Action Level (inch)	Maximum Allowable Level (inch)	Notes
For MPBX bottom sensors (located within 5-ft above the excavated MTBM profile)			
Crossing	0.25	0.5	Applicable to all MPBX(s) located along the MTBM alignment
For MPBX top sensor, Borros anchors, road prisms and other surface settlement monitoring points			
All Locations	0.1	0.25	Applicable to all surface mounted surveying markers

Note: No observed settlement is to be allowed for the utility settlement monitoring points at the aqueduct.

E. Groundwater Leakage:

1. Casing Pipe:

- a. Less than 10 gpm total inflow between launching and receiving shafts; and
- b. Less than 1 gpm at any isolated or joint locations.

2. Carrier Pipe: No leakage is allowed.

F. Surveying:

- 1. The Contractor shall provide a tunneling surveyor who will provide all survey work necessary for the tunneling work.
- 2. Control points shall be established sufficiently far from any tunneling and construction operation not to be affected by ground movement or damages.
- 3. The accuracy of the horizontal coordinates and elevation for each survey point shall be 0.01 foot.

G. Tunnel Navigation System:- Use a remotely controlled navigation system designed for an operational distance greater than the drive in which the proposed system will be used with sufficient accuracy to maintain the MTBM drive within the tolerances specified herein.

H. Slurry System - Stadium Conglomerate consists of high percentages of cobbles and gravel materials. Design the slurry system to successfully stabilize the excavated face by forming

“filter cake” and to adequately lubricate, transport and remove the excavated material from the heading to the disposal facilities.

- I. Lubrication: Monitor the lubricant mix proportion and automatically record the injection pressure and quantities for each hookup to sufficient accuracy so as to completely fill the annular space and to prevent an inadvertent return.
- J. Access to MTBM Cutterhead
 - 1. Free Air – During the course of the tunneling operation, access to the working chamber behind the cutterhead will be required for regular maintenance and replacement of cutting tools. Access under free air shall only be performed when groundwater seepage is less than 3 gpm and the excavated face at the heading remains stable and exhibits at least four (4) hours of standup time.
 - 2. Hyperbaric Intervention – When the ground exhibits any type of raveling or running ground conditions, free air entrance shall not be performed. Upon Engineer’s request, design, modify, procure, and implement safe hyperbaric intervention practices per the requirements of the latest Pressure Vessel for Human Occupancy (PVHO-1 or 2), Federal and Cal-OSHA regulations. Hyperbaric intervention shall only be performed by qualified individuals and company only.

1.8 QUALITY ASSURANCE

A. Qualifications

- 1. Microtunneling Contractor: Possess a valid California Contractor’s Class “A” license and qualified in the installation of pipelines using microtunneling as the method of installation. The microtunneling work will have to be performed by a special MTBM with face access capability and a microtunneling (sub)contractor that is qualified to use this type of special equipment. The Contractor shall assume a mixed face tunneling condition with fill and/or Lindavista soil above the springline and Stadium Conglomerate found at the tunnel springline or below; and a perched groundwater table at the interface.
- 2. Microtunneling engineer shall be a Professional Civil or Structural Engineer licensed in the State of California. .
- 3. Surveyor provided by the Contractor for the tunneling work shall be a Professional Surveyor licensed in the State of California.
- 4. Hyperbaric Intervention Team – Where applicable, company/subcontractor providing hyperbaric intervention support shall be qualified in performing compressed air entry activities. Supervisory personnel and intervention team members to be assigned shall be qualified in inspection, replacement of cutting tools, removal of obstructions, machine maintenance and/or repairs performed inside the MTBM working chamber.

B. Jacking pipe information

1. Jacking pipe capacity calculations shall be stamped and signed by the Microtunneling engineer. Calculations shall indicate the maximum theoretical and allowable capacities.
2. Working drawing showing dimensions of the proposed jacking pipe and IJS specials to calculate jacking capacity and specifically identify the factor of safety.
3. Working drawing showing detail design of the watertight joint of the jacking pipe.
4. Working drawings showing detail designs and layout of the lubrication and contact grout ports, and plugs.
5. Jacking force calculations shall specifically identify source of equation, normal effective stress, sources of friction factor, adhesion factor, use of lubrication, and the factor of safety. Equation and factors shall be from a widely accepted industry source acceptable to the ENGINEER.
6. CONTRACTOR shall determine the maximum anticipated construction loads, including jacking forces and handling stresses, proposed IJS locations, and ensure that the anticipated loads are implemented in the manufacturer's design of the jacking pipe, subject to the ENGINEER's review.
7. Manufacturer's written recommendations for repairs for joint failures and side wall failure of the casing pipe to comply with the structural and leakage requirements.

C. Progress reports: Prepare daily for each work shift and for the microtunneling drive. Each jacking report shall include:

1. Project Name
2. Date
3. Printed name of operator and signature.
4. Number of each pipe installed and length of pipe.
5. Pipe Stationing
6. Start and end time for each pipe joint.
7. Positions of IJS in the installed pipeline.
8. Start and finish times for each crew each day.
9. Field testing results of slurry and lubricant
10. Recorded MTBM data as required herein.
11. CONTRACTOR's interpretation of the recorded data.
12. Lubrication log as required herein (Section 02443 1.8.F).

13. Loss of slurry and/or volume of addition fresh slurry into the system.
 14. Obstructions, when encountered.
 15. Any unusual observations made in the field.
 16. Daily output or printout from the tunnel navigation system and auto data recording (Item E) systems including machine locations, operational parameters monitored, measured, and recorded to demonstrate progress.
 17. Muck volume per jacking pipe and daily total muck quantity
 18. Jacking report (Item E) – weekly
- D. Use an automated data recording system for the microtunneling system supplied. It shall be operated for the duration of the project and the records provided to the ENGINEER in a format acceptable to the ENGINEER. All parameters capable of being recorded by the microtunneling system shall be recorded at a maximum interval of 12 inches of MTBM advancement or every minute during tunneling, whichever comes first. During a stoppage, jacking force and face or earth pressure shall be recorded at least daily unless otherwise approved by the ENGINEER.
- E. Provide a separate jacking report prepared by hand to supplement information on the automated data recording system. Jacking report shall include three recording points of measurements for each pipe segment up to and including 10 feet long. The first recording point shall be within one foot of the start, second recording point shall be near the midpoint, and third recording point shall be within one foot of the end. For pipe segments longer than 10 feet add one recording point at the midpoint between the first and second recording points and add one recording point at the midpoint between the second and third recording points for a total of five recording points. For each of the recording points, record the following measurements and provide unit of measure:
1. Position and deviation of the MTBM in relation to design line and grade.
 2. Pitch, roll, yaw and drift of the MTBM
 3. Maximum jacking force and strokes exerted by each of the main jacks and each IJS.
 4. Position, pressure and jacking forces of each of steering jacks.
 5. Cutterhead torque and rpm of the cutter wheel
 6. Earth pressure measured closest to the face of the MTBM
 7. Inlet and outlet slurry quantities and pressures.
 8. Velocity and volume of slurry per time unit, including percentage of slurry volume bypassed through the system.
 9. Jacking rate and total distance jacked.
 10. Water jetting operating parameters including position of valves, maximum pressure, volume, and operating duration.
- F. Lubrication log shall include date, shift, number of batches mixed, and operator. For every hook up location, indicate pipe number, design mix, injected volume, duration and injection pressure that were used.

G. Contingency plans:

1. The spoils separation plan shall include changes to the separation plant and/or slurry additives upon the request of the Engineer or when testing performed in accordance with the approved submittals or operating parameters indicate the slurry is not performing as intended. Describe methods and procedures for making changes to the separation plant and/or slurry additives.
2. The MTBM operational plan shall include observational and operational characteristics being monitored that indicate the MTBM is not advancing, experiencing excessive ground movement, excessive deviation from contract line and grade, excessive "spikes" in cutterhead torque and jacking thrusts, in low blow count material, presence of elevated hazardous gas levels, excessive groundwater leakage and other non-compliance performances. The plan shall include an explanation of the probable causes. The plan shall also include replacing operators, advance rates, changes in the slurry mixes, pressures and other modifications to be made on the MTBM equipment and work procedure to be implemented in the field.
3. The obstruction removal plan shall include observational and operational characteristics that indicate the MTBM is not advancing due to an obstruction. The plan shall include the confirmation of the obstruction and methods to remove the obstruction considering face access, groundwater control, ground support methods, type of obstruction, location of stoppage, and impact to traffic and adjacent facilities. The plan shall also include procedures to abandon the tunnel should it become necessary, and shall include machine and pipe retrieval/pull back when appropriate, and backfilling of the abandoned opening with grout during the machine retrieval process.
4. The hyperbaric intervention plan shall include the decision process to determine when and where intervention is necessary. The plan shall include supervision, equipment, personnel, work procedures, training, implementing and monitoring that will be required for successful completion of the activities. Medical support team and facilities shall also be identified in the plan to provide emergency service when necessary.
5. The tunnel navigation plan shall include operational parameters observed, measured, and recorded to determine if the equipment has moved or distortion is affecting the guidance. If any reach of the installed jacking pipe is off line and/or grade, the plan shall include a return to the design line and/or grade as specified herein.
6. The jacking plan shall include operational parameters observed, measured, and recorded to determine if jacking force is increasing at a rate that would exceed jacking capacity or jacking force increase at a rate causing reasonable concern for completing the drive. Include actions and procedures to address situations when jacking force is increasing at a rate that would exceed jacking capacity or causes a concern.
7. The inadvertent return plan shall include cleanup methods on the ground surface, emergency telephone numbers, sources of equipment and materials needed for

containment and clean-up, and corrective actions for reducing operating pressures and modifying the slurry or lubricant. The plan shall include replacement of personnel when necessary and acceptable to the ENGINEER. Slurry and lubrication inadvertent return plan shall include operating parameters that are controlled with the intent of preventing an inadvertent return. Inadvertent return plan shall include a minimum shutdown period. The restart of mining will be permitted only after the satisfactory execution and completion of the procedures described in the approved contingency plan, and approvals from all agencies having jurisdiction have been obtained.

8. The jacking pipe failure plan shall include inspection, repair, and removal plans. Repair methods shall be acceptable to pipe manufacturer and the ENGINEER.
9. A remedial plan when groundwater leakage observed inside the casing pipe or direct jacked carrier pipe exceeds allowable limits.

1.9 SUBMITTALS

A. CONTRACTOR's qualifications as required herein:

1. Microtunneling Contractor, project superintendent(s) and MTBM operator(s)
2. Microtunneling engineer
3. Tunneling Surveyor
4. Hyperbaric Intervention Team

B. Microtunneling Machine

1. Shop drawings of microtunnel machine, including dimensions, design and configuration of cutter head, tooling, overcut, provisions for face access to the cutter and other machine features to comply with the requirements described in this Section. Indicate the unconfined compressive strength and the diameter of the largest spherical object that can pass through the cutter wheel and be crushed by the MTBM.
2. Preprinted machine specifications or a letter from the microtunneling machine manufacturer(s), in English, demonstrating that the selected machine(s) satisfies all aspects of the requirements in this specification and is capable of progressing through the anticipated soil/rock conditions as indicated in the Geotechnical Report for the proposed jacking diameter and distance, and to support all aspects of the proposed contingency plans.

C. Demonstrate that the proposed construction means and methods meet specified requirements:

1. A general description and schedule of the microtunneling procedure, including shaft/pit construction pertaining to microtunneling operation, equipment set-up, breakin/breakout treatment, MTBM excavation, work sequencing and schedule, method, spoil removal, spoil disposal, methods of protection and maintenance of project site, and groundwater control methods.

2. Written recommendations with the proper operational procedures for safe performing the hyperbaric intervention.

D. Working Drawings/Work Plan:

1. Layout, access and dimensions of work site, depth and dimensions of launching and receiving shafts; including jacking equipment within the pit/shaft and aboveground equipment at each location. Provide a separate drawing superimposing permanent civil works within the pit/shaft.
2. Design and schedule of installation of electrical system, lighting system, onsite power generation or electrical hookup.
3. Grade and alignment controls, and design of the navigation system including operating parameters, monitoring recording and QA/QC requirements. Manufacturer's specifications, manuals, and any drawings of the navigation system.
4. Methods for launch and retrieval of the MTBM including any modifications to the shaft. Additionally, describe procedures that will be used to confirm entry and exit portals are stable, prior to launch and retrieval of the MTBM.
5. Estimated daily volume of muck generated and means and methods for field measurement and verification.
6. MTBM retrieval or pull back system for a distance up to 300 feet from the launching shaft, including recovery of all installed pipe. Allow backfill grout/slurry to be discharged through MTBM cutterhead to fill in the abandoned tunnel during the pullback of the MTBM equipment.

Contingency plans - described in Part 1.8.

F. Slurry System:

1. Slurry system of the microtunneling machine, including a line diagram illustrating the operation, monitoring and controlling of the slurry system in applying hydrostatic counterbalancing pressure to the face.
2. Slurry management plan to avoid inadvertent return and spillage onto street surface.
3. Details of slurry system and soil separation methods. Include calculations of the system capacity, flow rates to handle sizes and quantity of the material anticipated. Demonstrate that the slurry system has sufficient pressure, velocity and volume to adequately transport and remove the excavated mucks as intended. Include pressure gauge and volumetric gauge locations.
4. Design mixes, additives and materials to be used for slurry to perform its intended functions in the subsurface conditions described in the Geotechnical Report. Include a targeted range of properties for each soil type, testing methods and requirements to

ensure that the slurry is within the proposed targeted properties and performing as intended. Targeted properties of slurry shall include measurements of the pH, unit weight, solid contents (percent of particular larger than No. 200 sieve) and viscosity.

5. Design of the slurry separation system including various components, and selection of screen sizes, scalper shaker, hydro cyclones and centrifuge for water based slurry with and without additives.
- G. Jacking system details, and numbers of intermediate jacking stations required and their proposed spacing, method of operation, thrust capacity, and sleeve details, plus method of control to prevent the maximum allowable jacking force from being exceeded.
- H. Auto Lubrication System: Description of lubrication mix equipment, control system and procedure for lubricating the pipe during jacking operations, including estimated injection volume at each port for the anticipated soils. Submit materials to be used for lubrication, with consideration of the groundwater conditions anticipated to be encountered along the alignment.
1. Location and pattern of lubrication ports along the MTBM and the jacking pipes.
 2. Mix designs including grout mix, proportions, density, slump, strength, viscosity, and pH.
 3. Demonstrate that the lubrication delivery system, including design calculations, shall have sufficient capacity, pressure and volume for lubrication to perform as intended.
 4. Estimated quantity of lubrication needed to fill in the annular gap for the soil conditions at each port.
 5. Injection and monitoring systems to allow independent control of the grout flow rate, volume and pressure at each port, including pressure gauge and volumetric gauge locations.
 6. Sample lubrication log sheet acceptable to ENGINEER.
- I. Jacking pipe information as required herein. Including manufacturer's certificate of compliance that the jacking pipe complies with project specifications.
- J. Power generation plant and slurry plant sound rating data. Sound level rating data shall be based on actual tests of an identical unit or a similarly packaged unit of equal capacity with calculated corrections submitted for review. Manufacturer's test procedure, equipment, and reporting shall conform to SAEJ1074, Engine Sound Level Measurement Procedure or ANSI/ASME PTC36, measurement of industrial sound.
- K. Provide a sample copy of all reports to be filed under this work including information available from automated data recording of the performance of the lubrication system, sampling frequency, and available formats for the ENGINEER to select.

- L. Notification:
 - 1. Provide minimum five work days advance notification of meeting date and time for any preconstruction meeting.
 - 2. Notification requirements during construction as specified herein.
- M. Survey plans for the tunneling work shall be done by the tunneling Surveyor and include the following:
 - 1. Records of the line and grade alignment information during the MTBM operation summarized using the Tunnel navigation system in a format acceptable to the Engineer. Submit the as recorded alignment information on a weekly basis.
 - 2. As-built drawings of the jacking pipe showing the horizontal coordinates and elevations, and deviations from the design line and grade of all pipe joints. Clearly indicate any out-of-tolerance locations on the as-built drawings. Submit cross sectional drawings also to highlight the clearance envelope between the casing pipe and the permanent product pipe.
- N. Job Hazards Analyses: Submit Injury and Illness Prevention Program for information only to demonstrate compliance with the law. The plan shall identify the potential hazards including chemical hazards to the work crew, the environment, and the surrounding communities. Include all the mitigation measures necessary to address these hazards. The plan shall also address all the safety issues that may be required for the work described in the contingency plans.
- O. Disposal Plan – Include disposal plan(s) for excavated spoils and wastewater generated during the microtunneling operation.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. Jacking pipe and joint shall be able to withstand the installation loads without cracking, breaking or suffering other damages.
- B. Steel Casing pipe:
 - 1. See sections 209-2.1 and 308 of the special provisions.
- C. Slurry and lubrication shall consist of high yielding sodium montmorillonite bentonite and polymers, additives, and water.
 - 1. Water shall be furnished by the CONTRACTOR from a potable water source.
 - 2. Specially designed for the groundwater qualities described in the Geotechnical report.

3. 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 accepted mix design(s).
4. Bentonite, polymers, and additives, other than soda ash and salt water additives, shall be NSF/ANSI Standard 60 Certified or equal for clean water testing. Additives shall not contain any hydrocarbons.

D. Cement:

1. Conform to the requirements of ASTM C150.
2. Type II or V.
3. Water shall be furnished by the CONTRACTOR from a potable water source.

2.2 EQUIPMENT

A. MTBMs and components.

1. General:
 - a. The microtunneling system shall be specifically designed for tunneling in geotechnical conditions stated in the Geotechnical Report, and allows the tunnel to be constructed without delay to the schedule of this project.
2. MTBMs: Approved MTBMs shall also satisfy the following requirements:
 - a. Equip with sufficient power and ability in normal operation to cut, fracture or crush hard material of sizes up to 1/3 excavated MTBM diameter and maximum 25,000 psi in compressive strength.
 - b. Prevent loss of ground through the machine during shutdowns.
 - c. Measure and provide pressure balancing support by the application of counterbalanced slurry pressure at the excavated face
 - d. Variable cutterhead rotational speed tailored to variable ground conditions.
 - e. Rugged and well armored cutterhead to resist abrasion. Use retractable cutterhead to allow MTBM to "un-jam" itself when stuck.
 - f. Equip with recessed, protected and backloaded disc cutters.
 - g. Limit the COR ratio to 20 percent or less to control the rate of excavation and flow of excavated muck through the cutterhead into the slurry chamber reducing overexcavation, the cutting torque and risk of stalling.

- h. Process sufficient torque in the cutterhead to remove material excavated or fallen from the face of the heading. Minimum torque required will be 350,000 ft-lb.
 - i. Include the use of a rock crusher breaking down gravel to cobbles sized material into smaller components (less than 3 inches) to be removed by the slurry system.
 - j. Provide access under both free air and under elevated atmospheric pressure to the cutterhead slurry chamber for maintenance, inspection, replacement of cutting tools and removal of obstructions.
 - k. Articulation to allow steering and line and grade corrections
 - l. Position the 1st intermediate jacking station within 100-ft from the tunnel heading.
 - m. Incorporate water tight seals between the MTBM, all trailing cans, and leading pipe.
 - n. Protect electric and hydraulic motors and operating controls against water damage.
 - o. Use bi-directional drive on the cutter head wheel, and/or adjustable fins or other means, to control roll.
 - p. Minimum annular space shall be 1 inch, unless indicated by the CONTRACTOR in the submittals and approved by the ENGINEER.
 - q. Capable of tunneling through ground improvement zones specified in the Contract Documents and at the break-in and break-out locations.
3. Cutting Tools shall include:
- a. Wear resistant scrapper; and
 - b. Multi-roller disc cutter designed for use in excavating rock and boulders up to compressive strength of 25,000 psi.
4. Slurry System: MTBM shall include an automated spoil transportation slurry system that balances the naturally occurring hydrostatic pressures by the use of a slurry pressure balance system. System shall be capable of adjustment required to maintain face stability. Slurry system shall:
- a. Balance, manage and control the pressure at the face by use of the slurry pumps, pressure control gauges, valves, and flow meters.
 - b. Include a slurry bypass unit in the system to allow the direction of flow to be changed and isolated, as necessary;

- c. Provide an upstream pressure gauge as close to the face as possible to provide real time reading and monitoring of the face pressure during operation and shut down
- d. Generate sufficient flow capacity, pressure and velocity in the slurry system to properly transport the mucks to the ground surface treatment facilities.

B. Slurry Separation Equipment shall:

- 1. Adequately separate the spoil from slurry so that slurry within the operating parameters can be returned to the cutting face for reuse. Use separation plant, including scalping screens, shaker screens, de-sanding and de-silting cones, and centrifuge as necessary for the conditions indicated in the Geotechnical report.
- 2. Use the type of separation process suited to the size and rate of excavation, the soil type and sizes being excavated, anticipated solid and fine contents in the slurry mix, and the workspace available at each launching pit/shaft.
- 3. Monitor the composition of the slurry to maintain the pH, slurry weight and viscosity limits defined by the operating parameters.
- 4. Protect against any slurry spillage and contain separated spoils in covered containers for removal from the site.

C. Pipe Jacking Equipment shall:

- 1. Jacking capacity to push the MTBM and the pipe string between the pit/shaft locations identified on the Working Drawings.
- 2. Impose sufficient thrust loads onto the cutting tools to fracture, crush and break up the rock formation and boulders encountered.
- 3. Hydraulic cylinder extension rates synchronized with the excavation rate of the MTBM.
- 4. Uniform distribution of jacking forces on the bearing end of the jacking pipe.

D. Remote Control System shall:

- 1. Allow for operation of the MTBM without the routine needs for personnel to enter the tunnel.
- 2. Display available to the operator, showing the position of the shield in relation to a design reference together with roll, pitch, complete navigation system, valve positions, thrust force, cutter head torque, rate of advance, installed length and slurry operating parameters.

3. Integrates the system of excavation and removal of spoil and its simultaneous replacement by pipe. As each pipe section is jacked forward, the control system synchronizes all of the operational functions of the system.
- E. Alignment Control shall:
1. Control line and grade per allowable tolerances.
 2. The system shall have the capability to provide real time navigation data including location check and record electronically the actual position of the machine for QA/QC confirmation by the City.
 3. Provide steering information when applicable.
- F. Lubrication System: System shall include pressure gauge, volumetric gauge, and shut-off valve on the pump or at the point of injection; and control and monitoring systems for the use of the operator. The lubrication stem shall be such that it can automatically be controlled from the operators cabin and controlled volumes of lubricant can be injected by the MTBM operator at selected locations along the tunnel, if necessary. Such volumes of lubricant pumped, including the location of injection, shall also be automatically recorded.
- G. Launch and exit seal – Include single or double rubber donut gaskets mounted to the shaft wall, with slide plates to prevent inversion.

PART 3 -- EXECUTION

3.1 GENERAL

- A. The MTBM shall not be launched until the receiving pit or shaft is completed and ready to receive the MTBM equipment.
- B. Complete the ground improvement at the MTBM break-in and break-out as indicated per requirements of the Contract Documents. Allow sufficient set time for grout to set prior to excavation work.

3.2 WORK AREA PREPARATION AND MAINTENANCE

- A. Organize of microtunneling surface equipment for the drive in such a manner as to enable proper operation at all times, to minimize impacts to property owners, to minimize inadvertent return and spillage, and to maintain traffic control patterns as specified.
- B. Any equipment operating with fuel, hydraulic, or lubrication oils shall be provided with suitable containment basins made of plastic lining and sand bags to ensure no loss of fluid to drains or water courses or to contaminate the ground.

- C. All equipment shall be maintained and kept in working order. All oil, hydraulic, or fuel leaks shall be repaired upon discovery. Any leaking equipment shall not be used until repaired.
- D. All lubricant, slurry, or materials leaked or spilled shall be contained, cleaned up, and disposed of properly.
- E. Remove excavated muck from work site during each working day to allow an accurate count of daily muck volume.

3.3 INSTALLATION

A. General

- 1. If allowable tolerances are exceeded or if the MTBM equipment failed to complete the drive not because of the presence of any obstructions or changed conditions, the CONTRACTOR shall pay all costs for correction, re-install, redesign, reconstruction, and re-inspection. If redesign is required, the CONTRACTOR shall obtain the services of a Professional Engineer registered in the State of California for the redesign.
- 2. Adjust the quality of the slurry by adding additives or by additional cleaning to satisfy the intended functions for stabilizing the face and for removing excavated spoils from the heading.
- 3. Inject lubricant continuously and at regular hookup interval to minimize the jacking forces. Provide and/or weld permanent pressure plug sealing lubricant port when no longer in use.
- 4. Measure the total groundwater inflow during the MTBM operation. Provide written notice within one working day of discovery and repair leakage prior to acceptance.

B. Alignment Establishment:

- 1. CONTRACTOR's tunneling surveyor shall check baseline and benchmarks provided by the CITY before commencing excavation and immediately report any errors or discrepancies to the ENGINEER.
- 2. Use the baseline and benchmarks provided by the CITY's surveyor to furnish and maintain additional reference control points, lines and grades for the pipeline construction.
- 3. Check the primary control for the microtunneling system against an undisturbed above ground reference at least once each week

C. Obstructions during Microtunneling:

1. Obstruction removal shall be performed by face access under free air or hyperbaric intervention, or by MTBM retrieval and tunnel abandonment. Sinking an emergency shaft for removing the obstruction will not be acceptable.
2. An object is not an obstruction unless the definition as described in Part 1.4 is satisfied. Obstructions as defined will be made in accordance with the Contract only if the following requirements are met by the CONTRACTOR:
 - a. Notify the ENGINEER in writing immediately upon encountering a suspected obstruction that stops forward progress. Perform an inspection at the heading and document the findings.
 - b. Upon written authorization by the ENGINEER, proceed with removal of the suspected obstruction by means of approved removal procedure.
 - c. When appropriate, collect representative samples of the obstruction for additional analyses to be performed by the Engineer.
3. The proposal of alternative methods for removing, clearing or otherwise making it possible for the microtunneling equipment to progress past a suspected obstruction that does not allow for the direct observation, documentation, measurement of the object or recovery of samples for grain size distribution, compressive strength testing shall not be considered for additional payment.
4. No additional compensation for removing, clearing, or otherwise making it possible for the microtunneling equipment to progress past an object that is not an obstruction shall be paid.
5. No additional compensation for replacement of worn cutter, making repairs to cutting tools or otherwise performing routine maintenance work, to achieve better performance of the microtunneling equipment so as to progress past an object that is not an obstruction shall be paid.
6. There shall be no additional compensation for damaged pipe or removal of damaged pipe when obstructions are not present.

D. CONTRACTOR shall not employ water jetting without a written request and the ENGINEER's written approval. Water jetting will only be authorized in soils classified as clays per ASTM D2487.

3.4 Hyperbaric intervention

A. When hyperbaric intervention is deemed necessary for face access to replace cutting tools, to perform inspection, investigation, maintenance and repair, and to remove obstructions, the Contractor shall submit the request for City approval, including the in-situ ground and

groundwater conditions, MTBM operational and performance data to justify the needs of such intervention activities.

- B. All intervention work to the MTBM working chamber shall commence within 5 working days once approved by the City.
- C. Any equipment necessary for intervention that cannot be mobilized within the 72-hr duration shall be designed, procured, fabricated, mobilized and installed ahead of time during the mobilization phase of the microtunneling work.
- D. Use of leased or rental hyperbaric equipment is acceptable as long as they are in full compliance of the hyperbaric intervention requirements as stated herein, Contractor's proposed methods and the required schedule.
- E. Company/Subcontractor and personnel on the intervention team shall also be properly trained and on standby, ready to be deployed within the required schedule.

3.5 CONTACT GROUTING

- A. Perform contact grouting immediately upon completion of the drive in accordance with Section 02441.

3.6 Field Quality Control:

- A. Immediately notify the ENGINEER, and provide written description of the incident and proper course of corrective actions when any of the following occurs:
 - 1. The CONTRACTOR encounters any one of the conditions described in the contingency plans.
 - 2. Any reach of the installed pipes is off line and grade by more than 50 percent of the maximum allowed.
 - 3. When ground movement reaches action levels specified herein. The likely cause of the ground movement shall be reported to the ENGINEER and actions shall be promptly taken to limit further settlements. Actions to be taken in response to the ground movement shall be reported to the ENGINEER before being taken, except in emergency situations.
- B. Immediately stop tunneling and notify the ENGINEER, perform an as-built survey of the installed jacking pipes, and provide written description of the incident and operational changes to be made when any of the following occurs:
 - 1. The CONTRACTOR's approved contingency plan fails to address the non-compliance issues in question.
 - 2. When any reach of the installed jacking pipes is off line and grade by more than 100 percent of the maximum allowed.

3. When ground movement reaches maximum allowable levels specified herein. The Contractor shall submit an action plan to be approved by the Engineer and actions shall be promptly taken to limit further settlement. The action plan shall include the following activities:
 - a. Install and monitor additional instruments and/or perform additional monitoring as directed by the ENGINEER.
 - b. Erect temporary barriers in areas of concerns limiting public access until ground movement is contained.
 - c. Perform a field investigation program such as SPT drilling to determine the extent of the ground loss;
 - d. Perform compaction grouting to fill in loss ground area.
 - e. Post construction monitoring of ground settlement
 4. Inadvertent return is detected.
 5. Excessive groundwater leakage into the inside of the jacking pipes.
- C. The cost of actions required to comply with the trigger levels specified herein and to repair any damage to adjacent facilities shall be borne by the CONTRACTOR with no cost to the CITY.
- D. As-built survey: Perform as-built survey from shaft to shaft after removal of the MTBM in accordance with the following:
1. Perform as-built survey of each casing pipe joint for two-pass installation. Each surveyed location shall be at the pipe invert and within a horizontal distance of 0.25 foot from the pipe joint.
 2. Record and submit to the ENGINEER quantities of water leakage at each pipe joint and the total for the entire length of the microtunnel reach.
- E. Field Testing:
1. Sample and perform the necessary test to evaluate the properties of the slurry including pH, solid content, unit density and viscosity. Recover slurry samples for testing at least twice a day from both the influent and effluent sides of the slurry separation unit.
 2. Sample and perform the necessary test to evaluate the properties of the lubricants including density, slump, strength, viscosity, and pH. Recover lubricant sample at least once a day from the point of injection at the batch plant.

PART 4 --

4.1 Contractor provided survey work shall be paid for under the bid item for the tunneling work.

****END OF SECTION****

SECTION 02445

INSTALLATION OF CARRIER PIPE IN STEEL CASING

PART 1 -- GENERAL

1.1 SCOPE OF WORK

- A. This section specifies requirements for the installation of the final carrier pipe and fiber optic conduit(s) inside a steel casing pipe; including requirements for the design of casing spacers/supports, bulkheads, concrete mixes and placement of backfill concrete.
- B. Product carrier pipes are to be installed either by pipe transport equipment (pipemobile), casing spacers or a railing support system.
- C. Requirements for microtunneling are specified in Section 02443.
- D. Requirements for fiber optic conduit are specified in Section 700-1.5.

1.2 RELATED NON-SSPWC SECTIONS:

- A. Section 02443 Microtunneling

1.3 REFERENCE CODES AND STANDARDS

- A. Unless otherwise indicated, the current editions of the following specifications and standards apply to the Work of this Section.
- B. American Concrete Institute (ACI):
 - 1. 304, Placing Concrete by Pumping Methods.
 - 2. 523, Guide for Cast-in-Place Low Density Cellular Concrete
- C. American Society for Testing and Materials (ASTM):
 - 1. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 3. C109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

4. C138, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
 5. C150, Standard Specification for Portland Cement.
 6. C191, Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle
 7. C266, Standard Test Method for Time of Setting of Hydraulic-Cement Paste by Gillmore Needles
 8. C495, Standard Test Method for Compressive Strength of Lightweight Insulating Concrete.
 9. C567, Standard Test Method for Determining Density of Structural Lightweight Concrete.
 10. C796, Standard Test Method for Foaming Agents for Use in Producing Cellular Concrete with Preformed Foam.
 11. C869, Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete.
 12. C939, Standard Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method)
 13. D6103, Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)
- D. AWWA Manual of Water Supply Practices – M9. “Concrete Pressure Pipe”.
- E. "Greenbook", Standard Specifications for Public Works Construction (SSPWC), and per the latest revisions by City of San Diego White Book.

1.4 DEFINITIONS

- A. Backfill Concrete: Cementitious material used to fill the void space between the carrier pipe and the initial ground support made of steel casing pipe.
- B. Backfill Grouting: The injection of backfill concrete to fill the void space between the carrier pipe and the initial ground support made of steel casing pipe.
- C. Cellular Concrete: A lightweight cementitious material that contains stable air or gas cells as a preformed foam uniformly distributed throughout the mixture, designed to fill the void space between the carrier pipe and the initial ground support made of steel casing pipe.
- D. Pit: A vertical opening where the depth of the excavation is less than the long dimensions of

the excavation. The word "pit" and "shaft" are used interchangeably in this specification.

E. Shaft: A vertical opening where the depth of the excavation is more than the long dimensions of the excavation. The word "pit" and "shaft" are used interchangeably in this specification.

F. Slurry Concrete: A type of backfill concrete as specified herein.

1.5 DESIGN REQUIREMENTS

A. Carrier pipe for crossing shall be made specifically for the underground installation method specified herein.

B. Carrier pipe and pipe specials shall be installed within the casing pipe with a minimum clearance:

1. Between steel casing pipe and carrier pipe = 6 inches; and
2. Between steel casing pipe and outside of fiber optics product pipe = 2 inches.

as measured between the inside casing pipe wall and the furthest projection of the product pipe's outer sidewall or bell or as indicated.

The CONTRACTOR shall include additional allowances for pipe transporting equipment, carrier pipe support and adjustment in the carrier pipe's line and grade in the event that the casing pipe is installed out of the line-and-grade tolerances specified in Section 02443.

C. The length of each section of the carrier pipe shall be as determined by the CONTRACTOR and shall not exceed the clearance between pit/shaft excavation support members measured parallel to the tunnel.

D. Installation tolerances of the carrier pipe, as measured from the design alignment shown on the Drawings - Refer to construction tolerances described in Section 02443 Part 1.7.

E. Backfill Concrete

1. Design grout mixes with appropriate properties to fully serve their intended purpose.
2. Completely fill in all annular gap and to seal all the external gap space between pipe joints for protection.
3. Minimum compressive strength tested at 28-day shall be as follows:
 - a. During the submittal phase - 500 psi for any trial design mix(es) to be approved by the City; and

- b. During construction phase – see Part 3.4.
- 4. All testing shall be performed in a certified laboratory acceptable to the City.

1.6 SUBMITTALS

- A. Working Drawings: Cross sections and profile drawings indicating relative arrangement of and dimensioned clearances between the as surveyed locations of the casing pipe, carrier pipe, fiber optics product pipes, casing spacers/supports, concrete/grout pipes, grout ports, termination and intermediate bulkheads, and other equipment and materials used in the performance of the work.
- B. Carrier/Product Pipe Shop Drawings and Methods Statements:
 - 1. Manufacturer’s written recommendations for shipping, handling, installing the carrier/product pipe, and backfill grouting.
 - 2. Carrier pipe for underground application, including any design modifications made and details.
 - 3. Methods and procedures for installing carrier pipe and the fiber optic conduits inside the casing pipe to comply with the line and grade requirements and to meet the tolerances and minimum clearances specified herein. When applicable, submit the design of the casing spaces, railing support system, or pipe transporting equipment or "pipemobile".
 - 4. Methods and procedures for installing carrier/product pipe and fiber optic conduits inside the casing pipe without any damages to the joint(s) and to ensure a watertight connection.
 - 5. Certification from carrier/product pipe manufacturer stating that the pipes and joints are designed or protected to withstand heat of hydration from backfill grouting, and loads from installation and backfill grouting, without damage. Define maximum allowable injection grouting pressure.
 - 6. Methods for cleaning and clearing casing pipe of all obstructions, foreign materials and water leakage before and during carrier pipe installation.
 - 7. Methods for preventing carrier/product pipes from rotating during installation and floating within the casing pipe during backfill grouting.
- C. Pips Spacers/Support Shop Drawings, Calculations, and Method Statement:
 - 1. Manufacturer’s technical literature and written assembly instructions.
 - 2. Calculations stamped and signed by the pipe spacer/support manufacturer’s or CONTRACTOR’s design engineer demonstrating the spacers are designed to withstand

thrust force and frictional forces during carrier/product pipe installation, buoyancy, backfill grouting pressure, heat of hydration, and construction loads, and have no adverse effect on the pipe.

3. Calculations stamped and signed by the designer of the carrier/product pipe manufacturer that the pipe and joint are designed to withstand the maximum thrust force and construction misalignment during carrier pipe installation.
 4. Shop drawings showing pipe spacer/support spacing, dimensions, configurations, joints, accessories and details.
- D. Provide manufacturer's technical information and written recommendations for all materials incorporated into the work.
- E. Backfill Concrete or grouting Working Drawings and Methods Statement:
1. Design details for termination and intermediate bulkheads, means and methods for end seal installation and construction, including means to remove all trapped groundwater in the annular space.
 2. Patterns and details for staging, sequencing, performing and monitoring the backfilling operation. For each stage of placement operation, include the means and methods for advancing concrete/grout pipes, placement of injection holes, grout ports, collecting and disposing of excess and waste material, collecting and disposing of water resulting from operations.
 3. Layout and description of equipment and facilities including:
 - a. Supply equipment.
 - b. Agitators or holding tanks.
 - c. Mixers.
 - d. Pumps.
 - e. Delivery piping and manifolds.
 - f. Hookup details including valves, packers, and gauges.
 4. Means and methods for:
 - a. Proportioning and mixing in the field.
 - b. Measuring injection pressure, quantity, and injection rate.
 - c. Maintaining injection pressure below specified limits.

- d. Sequencing, staging of the work and establishing basis and threshold values for modifying mixes.
 - e. Concrete/grout placement setup, staging and procedures to ensure no voids are left behind.
 - f. Furnishing, preparing, and plugging or patching injection holes
 - g. Single or Multiple stages/lifts
 - h. Estimated volume of material to be placed each lift/stage and verification in the field.
 - i. Corrective actions when voids or leakage are found in the backfill concrete
- F. Qualifications for the following:
- 1. CONTRACTOR's design engineer.
 - 2. Superintendent in charge of carrier pipe installation.
 - 3. Backfill concrete installer.
 - 4. Testing Laboratory
- G. Product Data:
- 1. Proposed mix, wet, dry densities and viscosity.
 - 2. Certified test results including unit weight, total air content, unconfined compressive strength at various elapsed times of the proposed mix from an independent approved laboratory.
 - 3. Initial set time of the grout and the working time before a 15 percent change in density or viscosity occurs.
 - 4. Ability to be pumped for long distance.
 - 5. Mixing and pressure control valves.
 - 6. Additional information required for cellular concrete:
 - a. Type, brand, source, and amounts of cement, fly ash, admixtures, foaming agent, and other additives.
 - b. Cellular concrete foam generator, mixing plant, pump, control valve and

pressure gauge assembly at the point of injection.

- c. Method for transporting and placing cellular concrete minimizing potential variations in the grout properties.
- d. Permeability of finished product

H. Daily production records submitted no later than the beginning of the following work day.

- 1. Carrier/product pipe installation records shall list footage of carrier/product pipes installed, joint testing results, line and grade, and maximum installation load.
- 2. Records of concrete placement including volume placed, grout pipe installation schedule, stationing of placement, injection locations, maximum injection pressure, time of placement, concrete test results as required herein, and designation of cylinder samples prepared that day.

I. Measures to resolve problems caused by out-of-tolerance casing pipe.

J. Provide minimum five work days advance notification of meeting date and time for any preconstruction meeting.

1.7 QUALITY ASSURANCE

A. Qualifications:

- 1. Backfill concrete installer specializing in the supply and placement of backfill concrete shall be capable of developing a mix design, batching, mixing, handling and placing backfill concrete in underground conditions.
- 2. CONTRACTOR's design engineer shall be a Civil or Structural Engineer registered in California. All work submitted under this section shall be prepared, signed and stamped by Contractor's design engineer. For use of cellular grout, the design engineer shall confirm that number of lifts, pumping pressure, and rate of injection will not collapse the foam.
- 3. Superintendent in charge of pipe installation shall be in responsible charge of similar work on a minimum of two projects of equivalent size and complexity within the past 5 years.

B. Cellular concrete:

- 1. Shall be designed in accordance with the requirements of this Section and ACI 523.1 and shall comply with ASTM C869.
- 2. Proposed testing for each mix shall be as follows:

- a. Prepare and test samples for 7-day, and 28-day unconfined compressive strength tests according to ASTM C31 for cylinders or ASTM C109 for cubes.
- b. Two sets of three samples each shall be made from each proposed cellular concrete mix. One set shall be tested at an age of 7 days, and another set shall be tested at an age of 28 days. Cellular concrete test specimens shall be made, cured, stored, and tested in accordance with ASTM C495.
- c. Determination of total air content of each proposed cellular concrete mix in accordance with ASTM C796. Wet density tests shall be made prior to the addition of the foaming agent and at the point of placement.
- d. Determination of unit weight of each proposed cellular concrete mix in accordance with ASTM C567.
- e. Determine the viscosity of the proposed cellular concrete mix in accordance with
 - (1) If fine aggregate is included in the mix – ASTM D6103
 - (2) If no aggregate is included in the mix – ASTM C939

1.8 PRECONSTRUCTION MEETING

- A. Hold a preconstruction meeting at least five work days but not more than 30 work days prior to commencing each of the following:
 1. Transport and installation of the carrier pipe.
 2. Construction stages
 3. Placement of backfill concrete
 4. Carrier/product pipe and joint testing requirements.
- B. Review and discuss the following items at the meetings:
 1. Results of the as-built survey of the steel casing, and necessary modifications have to be made for line and grade adjustments.
 2. CONTRACTOR's proposed carrier/product pipe support, cathodic protection, pressure test set up and procedure for pipes to be installed inside the steel casing.
 3. Construction methods, constraints and issues overview.
 4. Equipment operating parameters.

5. Review safety procedures as described in the CONTRACTOR's health and safety plan.
6. Quality control procedures and quality assurance requirements.
7. Field Testing and reporting requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Water: Potable, and free from deleterious amounts of alkali, acid, organic materials, or other impurities that would adversely affect the setting time, strength, durability, or other quality of the backfill concrete. For cellular concrete, if water is used to pre-form the foam, it shall not exceed 80 degrees Fahrenheit (°F).
- B. Cement: Type II and conform to ASTM C150. Minimum 4 sacks of cement per batch for backfill.
- C. Slurry concrete – Per SSPWC 450-C-2000 design mix per Table 201-1.1.2 (A).
- D. Cellular concrete shall be lightweight hardened cementitious material made from the combination of concrete and a foaming agent with an oven-dried minimum unconfined compressive strength listed in Part 1.5.E.
 1. Shall be designed in accordance with the requirements of this section and ACI 523.1.
 2. Cement: Conform to the requirements of ASTM C150.
 3. Fly Ash:
 - a. Class "C" or "F" fly ash, if used, shall conform to 201-1.2.5.3 in the Greenbook.
 - b. Use of flyash limited to 20 percent by weight of the total cementitious material in the mix design.
 4. Sand: Gradation shall comply with SSPWC 200-1.5.3 or per manufacturer's written recommendations.
 5. Admixtures: Admixtures, may only be used when specifically approved by the foaming agent supplier in writing.
 6. Foaming Agent:
 - a. Foam shall be generated by combining controlled quantities of air, water, and foaming agent under pressure.
 - b. Foam shall retain its stability until the cement sets to form a self supporting

matrix.

c. Foaming agent shall comply with ASTM C 869 when tested in accordance with ASTM C 796. The type and manufacturer shall be:

- (1) Mearl Geofoam Liquid Concentrate manufactured by The Mearl Corporation, Roselle Park, NJ;
- (2) Foam Liquid Concentrate manufactured by Cellufoam Concrete Systems;
- (3) Elastizell EF, Foam Liquid Concentrate manufactured by Elastizell Corporation of America;
- (4) Or approved equal.

E. Casing spacers:

1. Longitudinal separation between spacers, when installed on the assembled carrier pipe, shall not exceed the lesser of 8 feet or carrier pipe manufacturer's recommendation, and shall be placed within 2 feet on each side of the coupling or joint. Provide a minimum of 3 casing spacers per pipe length.
2. Design with a minimum factor of safety of 2.0 against all construction loads.
3. Casing spacers shall be designed without a riser at crown (12 o'clock) and a leg at invert (6 o'clock), and shall be symmetrical about the vertical axis.
4. Runner (legs) shall be made with low sliding friction material such as Ultra High Molecular Weight (UHMW) to allow long distance installation.
5. Casing spacers shall provide cathodic isolation of the carrier pipe from the steel casing pipe.
6. Casing spacers shall be non-conductive and sized for the carrier pipe to be installed within the specified line and grade tolerances.
7. Casing spacers shall be designed and installed to facilitate installation of concrete placement pipes and to ensure backfill concrete completely fills the void space between the casing pipe and the carrier pipe.
8. Casing spacers shall incorporate the routing of the fiber optic conduits.
9. Casing spacers shall not deform or become damaged from the heat of hydration of the backfill.
10. Casing spacers shall not damage the carrier pipe.

11. Casing spacers shall not be made of wood or wood skits.
12. Casing spacers shall be adjustable in height to allow for grade correction.

F. Carrier Pipe Support

1. Independent railing support system running the entire length of the casing pipe following the project line and grade and to support the full weight of the carrier/product pipe during transportation and backfill grouting operations.
2. Provisions protecting the carrier pipe from damages against sliding along the railing during placement.

G. Pipe end seals or end penetration seals for carrier pipe shall:

1. Provide cathodic isolation
2. Completely span the annular gap opening from top to bottom
3. Resist backfill pressure
4. Resist heat of hydration.

2.2 EQUIPMENT

A. Pipemobile – To be designed and submitted to the Engineer for approval.

B. Cellular Concrete Foam Generator System:

1. The batch system shall consist of a tank in which the foam liquid concentrate and water are first mixed. This dilute solution shall be discharged from either a pressurized tank or by means of a mechanical pump through a foam-making nozzle in which this solution is blended with compressed air in fixed proportions.
2. The continuous generating system shall consist of a container, which continuously draws the concentrate directly from its shipping container, automatically blends it with water and compressed air in fixed proportions, and forms the stable micro-bubbled foam.

C. Foam refining column or nozzle shall be calibrated for foam quality and discharge rate. The foam nozzle shall be timer-controlled to repetitively discharge any pre-selected quantity or to discharge continuously at a fixed rate.

D. Mixers and Pumps: The rates of mixing and pumping shall be properly adjusted and a continuous flow of cellular concrete shall be obtained at the point of placement.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Confirm that the steel casing pipe installation are within the tolerances specified for the design line and grade by performing a field survey of the completed tunnel per Section 02443 Part 3.6 requirements. If any location is out of tolerance, obtain the ENGINEER's acceptance before carrier pipe installation. Implement approved measures to resolve problems caused by out-of-tolerance pipe as required by the ENGINEER at no additional cost to the CITY.
- B. Repair, stop and seal any water leakage of the casing pipe that does not meet the criteria specified in Section 02443.
- C. Perform work in accordance with the approved submittals.

3.2 CARRIER/PRODUCT PIPE INSTALLATION

- A. Immediately prior to moving a carrier pipe section into the casing pipe:
 - 1. Verify that sections can be installed at their project line and grade within the required tolerance and clearance, and without interference or damage.
 - 2. Clean casing pipe and carrier pipe.
 - 3. Remove all potential obstructions inside the casing pipe including grout port assemblies and thrust rings for intermediate jacking stations.
- B. Acceptable methods of pipe installation: Install and position of each carrier pipe section to correct for any misalignment and to satisfy the minimum clearance requirements
 - 1. Carry each pipe separately into the heading by a "pipemobile" and mate it with the section of pipe already installed; or
 - 2. Adjust casing spacers and push the carrier pipe into the casing pipe with a steady, non-jerking motion. The maximum installation force shall not exceed the manufacturer's recommendations or the allowable thrust load on the carrier pipe barrel and/or joints; or
 - 3. Install an invert railing system to true line and grade. Lay the carrier pipe supporting on top of the railing system and push the carrier pipe inside, while protecting the outside the carrier pipe from any damage.
 - 4. Install the fiber optics product pipe simultaneously with the carrier pipe or in a separate, independent operation. Fiber optics conduits shall be installed more or less in a straight line within the tunnel.

- C. Perform welding or qualification testing of the carrier/product pipe joints as required.

3.3 PLACING BACKFILL CONCRETE

- A. Fill the carrier pipe and fiber optic conduit with water if counter measures against buoyant from backfill grout is not addressed.
- B. Backfill grouting shall be performed through multiple horizontal grout/slickline pipes inserted into the void space between the carrier pipe and casing pipe. Terminate end of the grout pipes regularly along the length of the grout zone to allow an even distribution of the backfill concrete. If there were "high" points along the casing alignment, terminate additional grout pipes to the high points to minimize air pockets that may be trapped behind.
- C. Alternatively, perform backfill concrete placement through grout ports embedded along the carrier pipe.
- D. Prior to placing backfill concrete, build bulkheads at intermediate locations and install casing pipe end seals at the pit/shaft locations.
- E. Discharge end of the grout/slickline pipes shall always be embedded inside freshly discharged concrete.
- F. Backfill grouting shall progress from the low end to the high end of the casing pipe, filling the entire void.
- G. Apply safe grouting pressure per manufacturer's recommendations and as approved by the City.
- H. Sloping joint for concrete placement in multiple lifts is acceptable as long as the advancing toe of the backfill concrete is always terminated at the end seal or any intermediate bulkheads.
- I. Install an exhaust/vent in the crown on the high end of the casing pipe.
- J. Install an injection pipe with shutoff valve on the low end of casing pipe.
- K. Placement of cellular concrete shall be completed in multiple lifts/stages and in a short duration to prevent an excessive increase in density, unit weight, consistency and separation.
- L. Employ the necessary means to ensure equal quantity of grout is placed on either side of the carrier pipe so as to avoid unbalanced loading.
- M. Continuous placement until backfill concrete overflows from the vent at the high end of the casing pipe and all the following conditions are satisfied:
 - 1. At least 100% of the theoretical calculated backfill concrete volume has been

placed

2. A minimum of 1.0 cubic yard of concrete overflows
3. No more air bubbles stop flowing out from the vent hole.
4. When all the required numbers of tested samples are taken.
5. Exhausted grout at each vent is not less than 85 percent of the wet density of freshly injected grout when tested per ASTM C138.
6. Exhausted grout at each vent is not less than 85 percent of the original viscosity of the freshly injected grout when tested per ASTM C939.

N. Close injection valve.

3.4 ERRANT GROUTING

- A. As soon as the following events occur, suspend grouting operations and notify the RESIDENT ENGINEER immediately:
1. A service connection becomes loose;
 2. A joint or bulkhead fails;
 3. Grout flow, injection pressures, etcetera, deviate from approved submittals; and
 4. Leakage at pipe joint and at bulkhead; and
 5. Pipe floatation

The Contractor shall meet with the Engineer as soon as practical after each grout placement and before the placement of the next reach of annular grout to discuss corrective measures or improvements in design or procedures.

3.5 FIELD QUALITY CONTROL

A. Completion of backfill grouting

1. To ensure backfill grouting is completed and no unfilled voids are left behind, the City will perform an inspection which will include opening of unhooked grout ports along the carrier pipe at a frequency of 1 per every 100 feet of installed pipe; where
 - a. No voids are to be found; and
 - b. No continuously leakage of water.

2. Unsatisfied performance will require remedial grouting or other corrective actions.

B. Backfill

1. Field control tests of the backfill concrete shall be performed by the CONTRACTOR and the results submitted to the ENGINEER. The CONTRACTOR shall provide all equipment and personal and facilities necessary to perform these tests.

2. The following testing shall be performed for backfill concrete:

- a. Unit Weight: Backfill concrete shall be tested for wet unit weight at the nearest location to the point of injection in accordance with ASTM C138 from each batch of concrete from which compression test cylinders are made. Unit weight of backfill concrete shall be within 5 percent of the unit weight of the approved mix design.
- b. Viscosity: Backfill concrete shall be tested for viscosity at the nearest location to the point of injection in accordance with ASTM C939 from each batch of concrete from which compression test cylinders are made. Viscosity shall be within 5 percent of the approved mix design.
- c. Compression Test Cylinders: Compression test cylinders shall be cast from each load, after every change in mix design, and at a frequency of not less than once per 20 cubic yard material placed or every 50-ft of grout placement. Each test cylinder shall be 6-inch by 12-inch. Test cylinders shall be sampled and made in the field, cured and stored in accordance with ASTM C31.

(1) Sampling Locations:

- (a) Taken from the concrete delivery truck – collect a set of three test cylinders; and
- (b) Taken from a system of valves in the line transporting the backfill concrete, which will allow for collection of test specimens at the nearest location to the point of injection without disconnecting the line from the outlet - collect a set of five test cylinders at each location.
- (c) Specimens shall also be taken from the overflow upon completion of the pour – collect a set of five test cylinders at each location.

- (2) Care shall be taken to ensure that cylinder samples are not jostled or moved prior to the initial set. Each set of test cylinders shall be marked or tagged with the date and time of day the cylinders were made and the location in the work where they were sampled.

- d. Compression Testing: Two samples collected per Part 3.5.B.2.c.(1).(a) shall be tested at an age of 28 days. The third sample taken at the truck shall be a spare. Two samples each taken per Part 3.5.B.2.c.(1).(b) and (c) shall be tested at 7 days and 28 days. The fifth sample shall be a spare. A strength test result shall be the average of the compressive strengths of the two cylinders made from the same concrete sample and tested at the same age. Testing of the spare sample will be required when there are obvious defects in the other samples collected.
 - e. Backfill concrete shall be tested for unconfined compressive strength in accordance with ASTM C39, and shall comply with the following criteria:
 - (1) Minimum average 28-day compressive strengths for any 5 consecutive samples taken per Part 3.5.B.2.c.(1).(a) shall be 450 psi; and
 - (2) No samples taken per Part 3.5.B.2.c.(1).(b) and (c) shall be less than 300 psi.
3. The following testing shall be performed for backfill cellular concrete:
- a. Unit Weight: Cellular concrete shall be tested for wet unit weight at the nearest location from point of injection (placement) in accordance with ASTM C567 from each batch of concrete from which compression test cylinders are made. Unit weight of backfill concrete shall be within 5 percent of the unit weight of the approved mix design.
 - b. Viscosity: Backfill cellular concrete shall be tested for viscosity at the nearest location from point of injection (placement) in accordance with ASTM C939/ASTM D6103 from each batch of concrete from which compression test cylinders are made. Viscosity shall be within 5 percent of the approved mix design.
 - c. Air Content: An air content test shall be made from each batch of concrete from which concrete compression test cylinders are made. Air content shall be determined in accordance with ASTM C796.
 - d. Compression Test Cylinders: Compression test cylinders shall be cast from each load, after every change in mix design, at a frequency of not less than once per hour. Each test cylinders shall be 3-inch by 6-inch. Test cylinders shall be sampled and made in the field, cured and stored in accordance with ASTM C495.
 - (1) Sampling Locations:
 - (a) Taken from the concrete delivery truck – collect a set of three test cylinders; and
 - (b) Taken from a system of valves in the line transporting the backfill concrete, which will allow for collection of test

specimens at the nearest location to the point of injection without disconnecting the line from the outlet - collect a set of five test cylinders at each location.

- (c) Specimens shall also be taken from the overflow upon completion of the pour – collect a set of five test cylinders at each location.
- (2) Care shall be taken to ensure that cylinder samples are not jostled or moved prior to the initial set. Each set of test cylinders shall be marked or tagged with the date and time of day the cylinders were made and the location in the work where they were sampled.
- e. Compression Testing: Two samples collected per Part 3.5.B.3.d.(1).(a) shall be tested at an age of 28 days. The third sample taken at the truck shall be a spare. Two samples each taken at the injection point per Part 3.5.B.3.d.(1).(b) and (c) shall be tested at 7 days and 28 days. The fifth sample shall be a spare. A strength test result shall be the average of the compressive strengths of the two cylinders made from the same concrete sample and tested at the same age. Testing of the spare sample will be required when there are obvious defects in the other samples collected.
- f. Cellular concrete shall be tested for unconfined compressive strength in accordance with ASTM C495, except that test specimens shall not be oven cured, and shall comply with the following criteria:
 - (1) Minimum average 28-day compressive strengths for any 5 consecutive samples taken per Part 3.5.B.3.d.(1).(a) shall be 450 psi; and
 - (2) No samples taken per Part 3.5.B.3.d.(1).(b) and (c) shall be less than 300 psi.

****END OF SECTION****

SECTION 02496

GEOTECHNICAL INSTRUMENTATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies requirements for designing, furnishing, installing, monitoring, reading, recording, interpreting, maintaining, protecting, and removing or abandoning geotechnical instrumentation. Requirements for the restoration of facilities affected by instrumentation removal or abandonment and maximum allowable or threshold values for geotechnical instrumentation are specified elsewhere.
- B. Protect City installed instrumentation at locations as indicated.
- C. Definitions:
 - 1. Extensometer: Reference head affixed to the borehole collar and connected to a down-hole anchor and rod assembly to measure displacement of the soil at the anchor location relative to the reference head.
 - 2. Geotechnical instrumentation: Devices measuring groundwater levels and pressures, ground stresses, surface and subsurface settlement, movement and displacement; and movement in existing infrastructures; and forces acting on and stress and strain levels in shaft supports and tunnel lining systems.
 - 3. Inclinator: Probe lowered within a special grouted borehole casing to monitor horizontal displacements occurring during construction relative to a fixed reference point at the top or bottom of the borehole.
 - 4. Interpretation: Including screening of data for correctness, identifying and confirming instrumentation data trends, identifying anomalies, comparing individual instrument data with other data, relating data to construction activities, and determining if potential problems are developing.
 - 5. Instrumentation: A general term applying to measurement devices and appurtenant probes, sensors, cabling, readout devices, and data loggers and management systems, including ancillary facilities required for their operation, such as boreholes, casings, housings, and covers.
 - 6. MPBX: Multi-Point Borehole Extensometer. Extensometers with more than one anchor.
 - 7. Standpipe Piezometer(s) / Observation Well(s): Single or multiple sSlotted and unslotted casing installed in a borehole to monitor groundwater levels.

8. Reference Survey Point: Established point monitored by optical survey methods to determine as applicable any vertical or lateral displacements occurring during construction.
9. Earth Pressure Cell: A device used to measure total pressure in the ground.
10. Strain Gauge: A device used to measure deformation representing the displacement between particles in the body relative to a referenced length. Utility Monitoring Plate – A steel plate with a riser to be installed inside a hollow PVC pipe and to be fixated to the top of an underground utility. Movement of the utility will be registered by the movement of the riser pipe that can be surveyed and recorded.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02443, Microtunneling.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. American Society for Testing and Materials (ASTM):
 1. ASTM A36 Standard Specification for Carbon Structural Steel.
 2. ASTM C778 Specification for Standard Sand.
 3. ASTM D1586 Test Method for Penetration Test and Split-Barrel Sampling of Soils.
 4. ASTM D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Sch 40, 80, and 120.
 5. ASTM D2487 Classification of Soils for Engineering Purposes.
 6. ASTM D2488 Standard Practice for Description and Identification of Soil (Visual – Manual Procedure).
 7. ASTM D5434 Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock.
- B. Standard Specifications for Public Works Construction (SSPWC).

1.4 SUBMITTALS

- A. General: Make submittals per Greenbook/Whitebook procedures.
- B. Product Data:
 1. Two sets of manufacturers' catalogs, specifications, installation, operating, and maintenance instructions for each type of data acquisition and management system, instrumentation component, and monitoring device, all as required for a complete installation.

C. Working Drawings and Methods Statements:

1. Indicate instrumentation types, locations, and layouts in conjunction with detailed plan of existing surface and subsurface utilities at a scale no less than 1:450. Include identification numbers with elevations, stations and offsets, and coordinates as applicable for each type of instrumentation. Include CITY-installed instrumentation on these drawings.
2. Indicate or describe the types, locations, and layouts of all instrumentation installed. Include identification numbers with elevations, stations and offsets, and coordinates as applicable for each type of instrumentation.
3. Instrumentation components and methods for their installation, maintenance, monitoring, removal, and restoration or abandonment. Describe protection of instrumentation to prevent damage.
4. Methods for gathering data and monitoring schedule for instrumentation to be monitored by the CONTRACTOR.

D. Mix Designs: Grout mix designs for grouted instrumentation.

E. Quality Control:

1. Qualifications:

- a. Manufacturer.
- b. Drillhole logger.
- c. Independent test laboratory.
- d. Company installing instrumentation and designated supervisory employee.

2. Certifications:

- a. Calibration certificates for each sensor, probe, readout device, and data logger by manufacturer or independent test laboratory.
- b. By manufacturer for materials specified in Part 2 herein.
- c. Accuracy of the drill hole logs
- d. Satisfactory installation of the said instrumentation
- e. By the Geotechnical Engineer or Certified Engineering Geologist certifying review and accuracy of drillhole logs.

- f. By the manufacturer's representative that CONTRACTOR is installing instrumentation in accordance with manufacturer requirements and that further on-site supervision is not required.
 - g. Acceptability of instrumentation installation techniques, procedures, locations, and schedule, from ENGINEER.
 - h. All initial readings of instrumentation taken by the CONTRACTOR.
3. Quality Control Plans:
- a. Proposed methods for identifying instrumentation, including alphanumeric identification, as specified.
 - b. Proposed format for presenting raw data readings. Include the date, time, and name of personnel taking measurements or performing monitoring.
 - c. Methods for assuring the quality of data readings.
 - d. Methods for protecting instrumentation and assuring timely repair or replacement of damaged installations and affected utilities.
4. Daily Records/Reporting:
- a. Drill logs for instrumentation within 48 hours of their completion.
 - b. Initial readings of instrumentation within 24 hours of their installation.
 - c. Hourly and daily monitoring records within 24 hours of their readings. Submit weekly plot of measured value versus time, including a time history of construction activities likely to influence such readings.
 - d. Daily groundwater elevations within one week of their readings.
 - e. Daily taken automatically within 24 hours of their readings.
5. Notifications:
- a. Allow 5 workdays for the ENGINEER to provide locations of CITY-installed instrumentation.
 - b. Report immediately if there were any utility interference with the proposed instrumentation.
 - c. Report damaged or malfunctioning instrumentation within 8 hours.
 - d. Report within 4 hours measurements indicating excessive movements/changes in the CONTRACTOR's or ENGINEER's installed instrumentation.

- e. Give notice to the ENGINEER not less than 48 hours before installing geotechnical instrumentation.
6. As-Built Data:
- a. Three copies of instrumentation installation surveyor's notes within 24 hours of their installation.
 - b. Inclinator data and plots acquired during verification of casing and borehole inclination within 1 day of installation. Where borehole is pre-installed along the soldier pile support system, submit inclination of the installed shoring.
 - c. Boring logs for all instrumentation holes within 72 hours of completion.
 - d. As-built plan of instrumentation type and location accurate to within 0.5 feet and at a scale no less than 1:450 within 24 hours of installing required instrumentation. Include identification numbers with elevations, stations and offsets, and coordinates as applicable for each type of instrumentation.

1.5 QUALITY ASSURANCE

A. Qualifications:

- 1. Manufacturer: Company that can meet minimum qualification in the fabrication of instrumentation of the type specified.
- 2. Drillhole logger: Geotechnical Engineer or Certified Engineering Geologist qualified to classify soil and rock.
- 3. Geotechnical Engineer or Certified Engineering Geologist registered in the State of California, certifying accuracy of the boring logs.
- 4. Test Laboratory: Independent laboratory that can meet minimum qualification in the testing of soil samples.
- 5. Instrument Installer: Company that specializes in the installation of instrumentation of the type specified.
- 6. Supervising Employee/ Instrumentation Specialist: Registered California Geotechnical Engineer or Certified Engineering Geologist with knowledge of installing and reading, monitoring and interpreting instrumentation of the type specified.

- B. All observation wells or piezometers shall be installed by California Licensed C-57 Well Drilling Contractor and the work shall be performed per California Well Standard Bulletin SB No. 74-90 well standard.

C. Acceptance Criteria: (NOT USED)

- D. Preconstruction Meeting: Before the first submittal is made meet with the ENGINEER to discuss the CONTRACTOR's geotechnical instrumentation program to ensure compliance with the Contract requirements.

1.6 DESIGN CRITERIA

- A. Install instrumentation at the locations and depths as specified herein or as indicated in the project plans.
- B. Installations shall be compatible with the subsurface conditions as described in the Geotechnical Geotechnical Data Report.
- C. Tolerances:
 - 1. Install instrumentation within 3 feet of the proposed location where necessary to avoid obstacles or utilities, or as approved by the ENGINEER.
 - 2. Survey Control: Provided by the CONTRACTOR surveyor for taking instrumentation readings. Achieve a level circuit closure with closure error no greater than $e = 0.61(N)^{1/2}$ where "N" is the number of readings and e is the error expressed in millimeters.
 - 3. Inclinator Casing Installation:
 - a. Twist and vertical misalignment: Less than 1 degree per 10 foot length of casing.
 - b. Vertical misalignment: Less than 3 degrees over the length of the entire casing.
 - 4. Extensometer Installation:
 - a. Within 2 degrees of vertical throughout its length.
 - b. Locate anchors within 3 inches of design depth.
 - 5. Earth Pressure Cells:
 - a. Within 2 degrees of vertical.
 - b. Locate within 6 inches of design depth.
 - 6. Pit Excavation and Support: Refer to Specification
 - 7. Initial Readings:
 - a. Reference point elevation: $\pm 1/10$ inch.
 - b. Reference point position: $\pm 1/4$ inch.

8. Utility Monitoring Point: Install in accordance with indicated requirements at locations per direction of the ENGINEER.

1.7 WORKSITE CONDITIONS

- A. Refer to the Geotechnical Report for a description of existing and anticipated subsurface conditions. The Contractor shall assume difficult drilling for any instrumentation to be installed inside the Conglomerate. Refer to Geotechnical Report for issues encountered during the exploratory boring program, and the Contractor shall plan accordingly.
- B. Verify the locations of utilities prior to installing instrumentation. Perform potholing to identify and expose utilities as necessary. Protect utilities encountered and maintain in good working condition.
- C. The Contractor and/or Instrumentation Company will have to develop traffic management plan for work to be performed outside the designated work area within the public right of way. Obtain all necessary permits and right of entry for installation.

1.8 SEQUENCING AND SCHEDULING

- A. Ensure that the specified instrumentation is installed, calibrated, the initial set of readings taken, and the instrumentation ready for monitoring construction
 1. Shaft Instrumentation - At least 14 days prior to shaft excavation; and
 2. Tunnel Instrumentation along Alignment -- Complete prior to shaft excavation to confirm. Instrument holes advanced along the alignment can provide additional top of bedrock information or tunnel excavation advancing within 300 feet in plan view of the instrumentation location.

1.09 PRODUCT DELIVERY, STORAGE, AND HANDLING (NOT USED)

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Bentonite: Standard Wyoming natural bentonite without additives, in granular, pellet or powder form as stated.
- B. Grout Mixes:
 1. Cement – Type II or V
 2. Provide a cement-bentonite or cement grout/seal mixture to conform to soil characteristics and shall be consistent with the physical properties described in the Geotechnical Report or per Manufacturer’s recommendations and requirements.
 - a. Strength - 50 to 100 psi compressive strength at 28 days

- b. Seal for stand-alone piezometer / observation Wells – 10^{-6} cm/sec
- 3. Lean Grout – sand cement mixture consists of a minimum of 1 sack of cement for each ton of sand/cement mixture.
- 4. Borros Anchor - A lean grout shall be provided for installing Borros-type anchors within drilled hole.
- C. Sand: Conforming to SSPWC Section 200 for Portland Cement concrete, except that 100 percent shall pass the No. 8 sieve.
- D. Water: Water shall be potable, clean, and free of organic matter, alkali, salts, and other impurities.
- E. Grout Mix: As specified herein and as recommended by the manufacturer for the type of instrument being installed. Grout mixes shall be approved by the ENGINEER prior to use.

2.2 EQUIPMENT

A. Data Management System

1. Provide an integrated system that automatically collects data from the geotechnical instrumentation and place it into a secure database using a data management system. The system shall also include all data from all manually read instruments and optical surveys.
2. The data management system shall be able to display current readings in engineering units for any sensor and the entire history of readings for that sensor.

B. Multi-Point Borehole Extensometers

1. Where indicated, provide multi-point borehole extensometers (MPBXs) to measure subsurface settlement. Extensometer assemblies shall be as manufactured by Geokon, Inc., Lebanon, NH, or approved equal. The assemblies shall include either stainless steel rods or fiberglass rods encased in PVC tubing with groutable anchors as recommended by the manufacturer based on the depth of the installation. Assemblies shall include Geokon Model 4450 vibrating wire head units, or approved equal, for each anchor, with a reading range of 8 inches (2 inches of heave and 6 inches of settlement) and a provision for making manual readings of the anchors.
2. Provide onetwo manual readout units. Manual readout units shall be Geokon Model 1400-4 Digital Depth Micrometer, or approved equal.
3. Provide seven Geokon 4-channel data loggers with USB Data connections, Model 8002-4-1, or approved equal.

4. Provide onetwo licensed copies of Logview and CSI-LOGGERNET or approved equal. Provide software for downloading, storage and display of extensometer data, as supplied by Geokon, or approved equal.
5. Data logging
 - a. Where surface access is not available - Provide wireless data logger, with D-cell lithium battery pack (for unattended operation) and RF moderm (For wireless data transmission), maintenance hole type lid antenna, software with data logger program.
 - b. Where surface access is readily available - Provide required access and accessories associated with the instruments and data collection systems; or the wireless data logger described above.
 6. Provide protective caps for the extensometer reference heads as recommended by the instrument manufacturer.

C. Inclinometers

1. Inclinometer Casings – Quick Connect (QC) inclinometer casings having a nominal outside diameter of 3.34 inches and internally grooved to receive inclinometer probe, as manufactured by Slope Indicator Co., 12123 Harbour Reach Drive, Mukilteo, WA, or approved equivalent.
2. Casing Sections – Casing shall be supplied in 10-foot lengths (Slope Indicator part No. 51150310), with no 10-foot length having more than 1 degree of twist before installation.
3. Heavy duty bottom caps (Slope Indicator part No. 51150330), and locking top caps (Part No. 51100550) shall be provided for each inclinometer;. Inclinometer Probes and Readout Indicators
 - a. Furnish onetwo complete systems to ensure the constant availability of functioning units on the Site in case of loss or failure of prime units.
 - b. Provide 24 inch wheel base probe (Model 50302500), 50 meter (164 Foot) control cable (Model 50601050), large pulley assembly (Model 51104606), a 650-foot slip-ring cable reel (Part No. 50503100), digitilt Datamate II (Model 50310900), and a DigiPro 2 license key (Model 50310101), all manufactured by the Slope Indicator Co., or approved equivalent.
 - c. Provide attachment(s) details to fasten the inclinometer casing to the soldier pile for installation.

D. Observation Wells / Piezometers

1. Provide plastic pipe of 2-inch diameter, polyvinyl chloride (PVC) Schedule 40 in accordance with ASTM D1785 and PVC end caps. The slotted and non-slotted lengths of pipe will be determined by the ENGINEER for each

location. Slotted sections will have three rows of factory cut 0.010 inch wide slots equally spaced about the circumference and such rows longitudinally spaced at ¼ inch. Unless otherwise indicated, length of the slotted intake section shall be 5-ft.

- E. Borros-Type Anchor
- F. Borros-type anchors shall be Model No. 51808000 manufactured by Slope Indicator Co., Seattle, WA; or approved equal. Anchor assemblies shall be furnished complete with top cap and other accessories as recommended by the manufacturer.
 - 1. Optical glass road prism shall be manufactured by GEO Instruments, Narragansett RI or approved equal.
- G. Utility Monitoring Plate
 - 1. Provide minimum 4" square/diameter steel plate connecting to a one-inch diameter steel pipe riser to within 2 inches below the top of the pavement. Attach a coupling at end of riser for ease of removal. Provide any additional hardware and couplers per approved Working/Shop drawings.
 - 2. Use minimum 6-inch diameter Schedule 40 PVC pipe as housing protecting the steel pipe riser. The PVC casing shall provide sufficient clearance and decouple from the steel pipe riser for it to move independently but together with the underlying utility.
- H. Provide filter material consisting of filter sand conforming to ASTM C778 Standard Specification for Standard Sand for 20-30 sand.
- I. Provide terminal boxes for each installation, Model 4999 as manufactured by Geokon, Inc., or approved equal, with an adequate number of connections for the number of gages to be monitored.
- J. Provide a vibrating wire readout box Model GK-405 as manufactured by Geokon, Inc., or approved equal.
- K. Temporary Surface Cover - Design for AASHTO H20 wheel loading
 - 1. Provide a cast iron unit, a Model 5TT with a fastening bolt, lift sockets and body extension, manufactured by Brooks Products, Inc., El Monte, CA; or similar by Morrison Bros. Co., Dubuque, IA; or approved equivalent. Provide lifting rod or pull-up device for lifting top cover.
 - 2. For Borros anchors, observation wells, and utility monitoring plates - minimum 6-inch in diameter;
 - 3. Provide steel or precast concrete maintenance holes or vaults with steel bolt-down covers for MPBX and inclinometer, sized to accommodate data

logger and wireless transmission device as appropriate. The maintenance holes and/or vaults shall be rain tight.

- a. For each inclinometer, the size of the vault or box shall be large enough to accommodate the "large" pulley assembly that will be used to take measurements.
- b. For each vibrating wire earth pressure cell, the size of the maintenance holes or vaults and shall provide adequate space for the insertion of a four channel data logger.
- c. For each vibrating wire extensometer, the maintenance holes or vaults shall be of sufficient size to accommodate the extensometer vibrating wire head units and shall provide adequate space for the insertion of a four channel data logger.

L. Temporary Surface Cover - Design for AASHTO H20 wheel loading

1. Provide a cast iron unit, a Model 5TT with a fastening bolt, lift sockets and body extension, sized to accommodate data logger and wireless transmission device as appropriate, manufactured by Brooks Products, Inc., El Monte, CA; or similar by Morrison Bros. Co., Dubuque, IA; or approved equivalent. Provide lifting rod or pull-up device for lifting top cover.
2. Provide steel or precast concrete maintenance holes or vaults with steel bolt-down covers for each instrument. The maintenance holes and/or vaults shall be rated for H-20 vehicle loading and shall be rain tight.
 - a. For each inclinometer, the size of the vault or box shall be large enough to accommodate the "large" pulley assembly that will be used to take measurements.
 - b. For each vibrating wire earth pressure cell, the size of the maintenance holes or vaults and shall provide adequate space for the insertion of a four channel data logger.
 - c. For each vibrating wire extensometer, the maintenance holes or vaults shall be of sufficient size to accommodate the extensometer vibrating wire head units and shall provide adequate space for the insertion of a four channel data logger.

M. Provide one laptop computer with a heavy duty case. As a minimum, the computer shall have the current operating system utilized by the Engineer (Windows 7 Professional or newer), Microsoft Excel, Powerpoint and Word software, a 15.6 inch screen size (1366x768 pixels), 2.5 GHz Intel Core processor, 8 GB RAM, 1 TB hard drive, a DVD drive, and two USB ports. The case shall be a Pelican Model 1495 with foam cushioning or approved equivalent.

N. The CONTRACTOR shall maintain ownership of all equipment described herein. All non consumable equipment can be leased for the duration of the contract.

2.3 SOURCE QUALITY CONTROL (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall install and monitoring instrumentation at locations as specified herein or as indicated. Do not install instrumentation within private property unless otherwise indicated or except as directed by the ENGINEER. Provide access for CITY to install Reference Survey Points as required.
- B. Use drilling equipment of sufficient capacity to advance the instrumentation borehole to the required depth and diameter in overburden soils and the Stadium Conglomerate.
- C. Log all instrumentation borings using the Unified Soil Classification System. Make logs of soil and rock encountered during drilling, including the presence of any contamination. Perform sampling in overburden soils at 5-ft interval, and to confirm top of Stadium Conglomerate within 1-ft of the actual depth. Place a portion of each soil sample in a plastic bag and Test the headspace of each soil sample recovered using a photoionization detector (PID) field instrument for qualitatively measurement of volatile organic compounds (VOCs).
- D. Make soil classifications and prepare logs in accordance with ASTM D2487, D2488, and D5434. All installations shall be logged by a qualified person according to Section 1.05. The CONTRACTOR shall preserve and store collected samples for the duration of the Contract.
- E. Inform the City immediately if top of Stadium Conglomerate is found more than 5 feet difference in elevation from the anticipated depth described in the Geotechnical Report.
- F. Protective breathing apparatus for workers and frequency of OVA/PID calibration shall comply with the Health & Safety Plan, which must be available onsite before any subsurface work can proceed on the project.
- G. Provide unrestricted and safe access to geotechnical instrument locations, allowing the ENGINEER to take measurements as necessary.
- H. Provide the CITY ENGINEER with two (2) sets of labeled keys to each locked item.
- I. Mark the boring locations on the ground surface prior to actual drilling. Arrange for existing utilities to be located and provide a minimum of 3 days advance notice to DigAlert and the ENGINEER. Adjust instrumentation location where necessary to avoid subsurface utilities. If the boring location is within 3 feet of a marked utility, expose that facility by hand excavation or potholing prior to drilling.

3.2 INSTALLATION

- A. General

1. All installations shall be permitted and conform to permitting requirements for boreholes, monitoring wells, telemetry and all associated instrumentation. The CONTRACTOR shall obtain and pay for all required permits.
2. Tremie bentonite-cement or sand-cement grout from the bottom of the hole.
3. Maintain piezometers. Keep the observation wells in good condition until the end of the trenchless work.
4. Prior to the installation of each instrument, verify that borehole inclinations are within specified limits.
5. At each Borros anchor, extensometer, earth pressure cell, inclinometer, and piezometer location, install a temporary cover, maintenance hole or vault in accordance with the requirements of Section 2.02. The excavation for installation of the maintenance holes or vaults shall be of adequate depth to accommodate the instrumentation to be installed at each location. Saw cut concrete and asphalt in accordance with SSPWC Section 306 requirements for temporary re-surfacing. The maintenance holes or vaults shall be installed on a concrete base. Drainage shall be provided through the concrete base to allow for the percolation of any water that enters the vault into the underlying soils. Make the cover flush with the ground surface or paved surface and fill the annular space between the maintenance holes or vaults and the excavations with lean concrete. Project instrumentation within 3 inches of surface and not closer than 2 inches above bottom of hole or as required for reading the instruments. In addition, vibrating wire installations need to provide adequate space for the installation of 4-channel data loggers.
6. Cap bottom of casings and fill annular space between casings and sides of holes with cement grout pumped through a pipe or small tube to the bottom of the hole.
7. Provide reference point for measurement of ground (pavement) surface elevation at each instrumentation location.
8. All installation shall be performed under the supervision of the Instrumentation Installer. Confirm operation of each instrument immediately after completion of instrumentation.

B. MPBXs

1. Drill boreholes to the diameter recommended by the manufacturer, at the locations indicated on the project plans, to the required depths to receive the MPBX sensors. Depth of the sensors shall be as indicated or as follows:
 - a. Top sensor – 5-ft below ground surface

- b. Bottom sensor – 5-ft above the excavated MTBM profile or 5-ft below top of Stadium Conglomerate as measured in the logged borehole, whichever is shallower.
2. Prior to MPBX installation, verify that borehole inclinations are within specified limits. Install extensometers per the project plans and the recommendations of the manufacturer.
3. Backfill the boreholes with cement grout. The CONTRACTOR's borehole logging and sampling program shall be used for the purpose of confirmation of the ground conditions and basis of grout mix design. Upon setting, the grout mix shall conform to the soil consistency and physical properties of the surrounding soil and/or rock as presented in the GDR and GBR and comply with the manufacturer's recommendations. The grout mix shall be approved by the Engineer prior to use.
4. Verify that MPBX heads are in position to be read manually or automatically..
5. Install vibrating wire head units, connect a data log and take initial readings immediately after installation. Take at least three initial readings of each extensometer instrument to establish an initial value, at intervals of at least 24 hours. if initial readings show large variations, additional readings will be taken to establish an acceptable initial reading.

C. Inclinometer

1. Drill minimum 6-inch-diameter and maximum 8-inch-diameter holes at locations indicated, to the required depths, to receive inclinometers. Case holes with a temporary flush joint type casing to prevent caving. Hollow stem augers may be used in lieu of casing. As Use of dAs aan alternative method drilling fluid of a self-destroying type, which loses its viscosity after a period of time, is also acceptable may be used. After reaching the required depth, clean the hole of loose earth, particles of cuttings and other debris.
2. Alternatively, inclinometer casing may be attached to the inside flange of the soldier pile in pre-drilled borehole during the time of shoring installation. Bottom of the casing shall be no more than 2-ft above the tip of the soldier pile.
3. Install casings in accordance with the inclinometer manufacturer's installation instructions to the depths indicated on the project plans. Orient one grooved axis of casing perpendicular to the nearest excavation wall. Install casing within 3 degrees of vertical.
4. Fill the annular space between casings and sides of holes with cement grout. The CONTRACTOR's borehole logging and sampling program shall be used for the purpose of confirmation of the ground conditions and basis of grout mix design.

5. Take three readings within 24 hours of each other immediately after the grout has set.
6. Maintain inclinometer casings in operating condition from the time of installation until completion of excavation backfill. Establish and maintain convenient access.

D. Road Prism

1. Install in accordance with manufacturer's recommendations and approved submittals.
2. Install an array of three road prisms (along centerline of the MTBM alignment, 10-ft offset to the right and left) at 25-ft spacing for the tunnel reach located
 - a. 48" SDCWA aqueduct crossing: Install approximately 6 road prisms.
3. Establish a direct line of sight between the prisms and the proposed location of the surveying equipment.
4. Install and complete the initial readings of the road prism' locations and elevationsBorros anchors prior to commencing of the MTBM drive.

E. Utility Monitoring Plates:

1. Proposed locations to receive Utility Monitoring Plates
 - a. One each at launching and receiving shafts at each crossing.
2. Use potholing to confirm the locations and depths of the utilities scheduled to receive the monitoring plate instruments. Mechanical pit excavation is acceptable except the last 2-ft shall be performed by hand-held equipment.
3. Center and install the PVC casing in the excavation to the top of the utility. Backfill the excavation with lean grout. Fill the PVC casing with water or slurry gradually and simultaneously to prevent excessive leakage of grout to inside the casing.
4. Clean out all foreign material inside the PVC casing and insert the monitoring plate with riser to top of utility. Top of the riser pipe shall be cut to no more than 2-inch below the ground surface.
5. Centralize the riser pipe inside the PVC casing and fill the void between with commercial grade oakum, tightly packed, to keep out any foreign material. Make sure the steel riser is free to move together with the underlying utility.
6. Utility Settlement plates are to be installed to a depth above the groundwater table. Notify the Engineer immediately when groundwater is found present.

7. Install and complete the initial readings of the monitoring plates after permeation grouting but prior to commencing of any construction activities.

F. Standpipe Piezometers / Observation Wells

1. Drill adequately sized minimum 6-inch-diameter and maximum 8-inch-diameter holes at locations as indicated, to the required depths for receiving the, to receive standpipe piezometers. Case holes with a temporary flush joint type casing to prevent caving. Hollow stem augers may be used in lieu of casing. Use of As an alternative method drilling fluid of a self-destroying type, which loses its viscosity after a period of time, is also acceptable may be used. After reaching the required depth, clean the hole of loose earth, particles of cuttings and other debris.
2. Set well casing to the depths required indicated on the project plans. Flush self-destroying drilling fluid, if used, out of the hole. Place sand filter material in the hole to surround the pipe up to three feet above the screen interval taking care not to place the sand so fast that it arches within the hole and leaves voids. Place a minimum of one foot of granular bentonite, followed with sand cement or bentonite-cement grout to the elevation of the bottom of the protective maintenance hole or vault. In all cases, sand pack and annular seals shall be consistent with permitting requirements.
3. For multiple wells to be installed within the same instrumentation location, separate the top and bottom well intakes by at least 5-ft thick bentonite seal in between. The depths to bottom of the well intakes at each piezometer are as follows:
 - a. Top intake – Locate bottom of the intake at 35-ft below the top of Stadium Conglomerate;
 - b. Bottom intake – Locate bottom of the intake at 5-ft below the excavated invert of the shaft.
4. Develop each standpipe piezometer by bailing to remove excess fines from the filter pack.
5. Groundwater measurements to be taken:
 - a. After well development, demonstrate to the Engineer proper functioning of these wells by by measuring rate of rise or fall of water levels in such well therein. For observation wells installed inside the curtain grout ring wall, the measured field permeability has to be below the allowable leakage rate.
 - b. Initial readings for all wells - Perform daily readings at different times of the day during the 3-day initial period, especially during the high and low tides.

6. The Contractor shall also perform monitoring/reading of the groundwater level in wells installed at all observation wells. regardless whether it is installed by the City at locations as indicated or the Contractor..

3.3 FREQUENCY OF READINGS

- A. Monitoring and data interpretation are to be performed by the Contractor, and report to the Engineer as needed.
- B. For readings taken manually
 1. Instrumentations installed at the shaft locations
 - a. Readings to be taken daily during shaft construction;
 - b. Readings to be taken 3 times a week during MTBM operation
 2. Instrumentations installed along the tunnel alignment
 - a. Within the zone of influence - Position of instrument located at 50-ft ahead and 100-ft behind the advance of the MTBM - readings shall be taken two times a day;
 - b. Outside the zone of influence - readings taken once a daily.
- C. For readings taken automatically using data logger or wireless remotely
 1. Instrumentations installed at the shaft locations
 - a. Readings to be taken hourly
 2. Instrumentations installed along the tunnel alignment
 - a. Within the zone of influence - Position of instrument located at 50-ft ahead and 100-ft behind the advance of the MTBM - readings to be taken every 5 minutes;
 - b. Outside the zone of influence - readings taken hourly.

3.4 MAINTENACE, REPAIR AND PROTECTION

- A. Protect instrumentation in accordance with manufacturer's recommendations.
- B. Maintain, repair, or replace instrumentation in accordance with manufacturer recommendations. Repair or replace in whole or part as necessary to maintain function within 48 hours of loss of operation or damage at no additional cost to the CITY.
- C. Check any battery powered equipment frequently making sure no loss in data collection and transmission.
- D. Repair damage to facilities in accordance with SSPWC Section 306 requirements for permanent resurfacing.

3.5 FIELD QUALITY CONTROL

- A. Perform installations under the supervision of the manufacturer's representative for as many installations as necessary to verify that the CONTRACTOR's personnel are capable of installing these devices properly without such supervision.
- B. Unless otherwise stated, take three sets of initial readings for all instrumentation installation in the presence of the ENGINEER to demonstrate the adequacy of the installation and to demonstrate the satisfactory operation of the instrumentation.

3.6 REMOVAL

- A. Upon completion of Work, demolish inclinometer casings and extensometers (MPBX) to a minimum depth of 20 feet below the ground surface. Backfill inclinometer and excavation casing with lean concrete. Remove and dispose of traffic covers. Construct new pavement patches in paved areas in accordance with City standards.
- B. Before final acceptance of the Work, abandon all stand pipe piezometers, including observation eight wells installed in exploratory borings completed by City before construction, per City, County, and/or California state regulations. Remove and dispose of protective traffic covers.
- C. Fill remaining holes drilled in masonry or concrete surfaces for the instruments with Portland cement mortar.
- D. Backfill excavations made over and around utilities.
- E. Dispose of all other components of the instrumentation in an appropriate manner.
- F. Repair damage to surface facilities in accordance with Section 306.

END OF SECTION

SECTION 13300

INSTRUMENTATION AND CONTROL

PART 1 – GENERAL

1.1 WORK OF THIS SECTION

- A. The CONTRACTOR shall provide all Instrumentation and Control systems (I&C) complete and operable, in accordance with the Contract Documents. The requirements of this Section apply to all components of the I&C unless indicated otherwise.
- B. The Contractor shall provide PLC (Programmable Logic Control) Programming for the project. Programming of the Central HMI system will be done by the CITY, CONTRACTOR to coordinate and provide support for this task.
- C. Responsibilities
 - 1. The CONTRACTOR, through the use of a qualified Instrumentation Subcontractor or vendor and qualified electrical and mechanical installers, shall be responsible to provide the CITY the implementation of the I&C system as the design intent of the drawings outline as well as the integration of the I&C with other required instrumentation and control devices.
 - 2. Due to the complexities associated with the interfacing of numerous control system devices, the Instrumentation Subcontractor or vendor shall be responsible to the CONTRACTOR for the integration of the I&C with existing devices and devices provided under other Sections and provide a completely-integrated control system free of signal incompatibilities and logical errors.
 - 3. As a minimum, the Instrumentation Subcontractor or vendor shall perform the following work:
 - a. Implementation of the I&C:
 - (1) Prepare complete and accurate shop drawings, reflective of the existing field conditions.
 - (2) Design, develop, and electronically verify complete and accurate control and electrical panel design and functionality according to specifications, and field conditions.
 - (3) Conduct operations and maintenance training for CITYs

personnel on maintenance calibration and repair of all instrumentation provided under this contract.

- (4) Procure hardware and provide a complete and accurate bill of materials.
- (5) Fabricate panels
- (6) Perform factory tests on panels
- (7) Perform bench calibration and verify calibration after installation
- (8) Oversee and guarantee installation for accuracy and totality to design and functionality.
- (9) Oversee, complete set of documents. Label all wires, verify and guarantee complete loop testing results.
- (10) Oversee, document, and certify system commissioning
- (11) Perform comprehensive testing that guarantee accurate and complete system functionality, as well as testing component level accuracy to within manufactures specifications.
- (12) Provide complete and accurate operations and maintenance manuals to include drawings, BOM, specifications, procedures, calibrations, certificates.
- (13) Conduct operations and maintenance training for CITYs personnel on maintenance calibration and repair of all instrumentation provided under this contract.
- (14) Provide drawings that are complete, correct and of sufficient quantity to have copies located at every maintenance location. Submission should also include an electronic set of the originating files.
- (15) Prepare calibration sheets
- (16) Certify the installation of the I&C with CITY staff
- (17) Perform complete loop check test on all analog/digital signals. Tests continuity and verify labels of all wires on panel.

b. Integration of the I&C with instrumentation and control devices being provided under other Sections:

- (1) Develop all requisite loop drawings and record loop drawings associated with equipment provided under other Divisions and CITY-furnished and existing equipment.
- (2) Resolve signal, power, ground and/or functional incompatibilities between I&C and all interfacing devices. Document and guarantee results.

4. Instrumentation Subcontractor or vendor responsibilities in addition to the items identified above shall be at the discretion of the CONTRACTOR. Additional requirements in this Section and Division 13 that are stated to be the CONTRACTOR's responsibility may be performed by the Instrumentation Subcontractor or vendor.

D. Certification of Intent:

1. Fifteen days after Notice of Apparent Low Bidder, the CONTRACTOR shall submit a certification from the selected Instrumentation Subcontractor or vendor. The certification shall be typed on letterhead paper of the Instrumentation Subcontractor or vendor firm. The certification shall be signed by an authorized representative of the Instrumentation Subcontractor or vendor. The certification shall include the following statements:
 - a. (Company name) "hereby certifies intent to assume and execute full responsibility to the CONTRACTOR to perform all tasks defined under Subsection 13300-1.1C.3 in full compliance with the requirements of the Contract Documents."
 - b. "It is certified that the quotation to the CONTRACTOR includes full and complete compliance with the requirements of the Contract Documents without exception."

E. Documentation of Instrumentation Subcontractor Qualifications:

1. Recommend a list of at least two instrumentation and control system projects successfully completed, of size and scope similar to that described herein, in which the applicant performed system engineering, system fabrication and installation, documentation (including schematic, wiring and panel assembly drawings), field testing, calibration and start-up, operator instruction and maintenance training. Each of the references cited must be accompanied by a written confirmation of the accuracy of the data by a managerial member of the control system operational staff.

2. Furnish the name of the individual person who will be responsible for office engineering and management of this project, and the individual who will be responsible for field testing, calibration, start-up, and operator training for this project. Include references of recent projects of these individual persons.
3. Submit specific documentation which verifies that Instrumentation Subcontractor employs the minimum of individuals who have been formally trained in the application of the:
 - a. Indicated operating systems.
 - b. Indicated software packages.
 - c. Indicated graphical user interface software packages.
4. Document that the applicant's company has been actively involved in the instrumentation systems business (under the same corporate name).

1.2 RELATED SECTIONS

- A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.
 1. Section 16010 Basic Electrical Requirements
 2. Division 13

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. The Work of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal code:
 1. National Electrical Code (NEC)
 2. International Building Code (IBC)
- B. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:
 1. ANSI/SA S 5.1 Instrumentation Symbols and Identification
 2. ISA Standards International Society of Automation

3. ISA-S20 Specification Forms for Process Measurement and Control Instruments

1.4 CONTRACTOR SUBMITTALS

A. General: Submittals shall be furnished in accordance with the following:

1. Coordinate the instrumentation Work so that the complete instrumentation and control system will be provided and will be supported by accurate shop drawings and record drawings.
2. Symology and Nomenclature: In these Contract Documents, all systems, all meters, all instruments, and all other elements are represented schematically, and are designated by symbology as derived from International Society of Automation Standard ANSI/ISA S5.1 - Instrumentation Symbols and Identification. The nomenclature and numbers designated herein and on the Drawings shall be employed exclusively throughout shop drawings, and similar materials. No other symbols, designations, or nomenclature unique to the manufacturer's standard methods shall replace those prescribed above, used herein, or on the Drawings.

B. Instrument Submittal:

1. Provide a complete index that lists each device by tag number, type and manufacturer. Provide a data sheet for each different type of instrument with the list of tag names. Provide a technical brochure for each data sheet.

C. Shop Drawings:

1. General:
 - a. Shop drawings shall include the letter head or title block of the Instrumentation Subcontractor. The title block shall include, as a minimum, the Instrumentation Subcontractor's registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing.
 - b. Organization of the shop drawing submittals shall be compatible with eventual submittals for later inclusion in the operations and maintenance information. Submittals that are improperly organized or incomplete for a given loop will be rejected.
 - c. Shop drawing information shall be bound in standard size, 3 ring, loose leaf, vinyl plastic, hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 3 inches.

- d. Interfaces between instruments, motor starters, control valves, variable speed drives, flow meters, chemical feeders and other equipment related to the I&C shall be included in the shop drawing submittal.
2. Project-Wide Loop Drawing Submittal: Furnish a Project-wide Loop Drawing Submittal (PLDS) that completely defines and documents the contents of each monitoring, alarming, interlock, and control loop associated with equipment provided under the instrumentation sections, equipment provided under sections in other Divisions, existing, and CITY-furnished equipment that is to be incorporated into the I&C. The PLDS shall be a singular complete bound package electronically drafted in INTERGRAPH MICROSTATION format, submitted within 120 days after contract award, and shall include the following:
 - a. A complete index in the front of each bound volume. The loop drawings shall be indexed by systems or process areas. All loops shall be tagged in a manner consistent with the Contract Documents. Loop drawings shall be submitted for every analog and discrete monitoring and control loop.
 - b. Drawings showing definitive diagrams for every instrumentation loop system. These diagrams shall show and identify each component of each loop or system using legend and symbols from ANSI/ISA S5.4 - Instrument Loop Drawings, and as defined by the most recent revision in ISA. Each system or loop diagram shall be drawn on a separate drawing sheet. Loop drawings shall be developed for loops in equipment vendor supplied packages, equipment provided under the instrumentation sections, and CITY furnished equipment. The loop drawings shall also show all software modules and linkages. In addition to the expanded ISA S5.4 requirements the loop diagrams shall also show the following details:
 - (1) Functional name of each loop.
 - (2) Reference name, drawing, and loop diagram numbers for any signal continuing off the loop diagram sheet.
 - (3) MCC panel, circuit, and breaker numbers for all power feeds to the loops and instrumentation.
 - (4) Designation, and if appropriate, terminal assignments associated with every manhole, pullbox, junction box, conduit, and panel through which the loop circuits pass.
 - (5) Vendor panel, instrument panel, conduit, junction boxes, equipment and PLC I/O terminations, termination identification wire numbers and colors, power circuits, and

ground identifications.

- c. Itemized instrument summary. The instrument summary shall list all of the key attributes of each instrument provided under this Contract. As a minimum, attributes shall include:
 - (1) Tag number
 - (2) Manufacturer
 - (3) Model number
 - (4) Service
 - (5) Area location
 - (6) Calibrated range
 - (7) Loop drawing number
 - (8) Associated Local Control Panel, PLC (Programmable Logic Controller), Process Control Module, or RCP (Remote Control Panel)
3. Test Procedure Submittals:
- a. Submit the proposed procedures to be followed during tests of the I&C and its components.
 - b. Preliminary Submittal: Outlines of the specific proposed tests and examples of proposed forms and checklists.
 - c. Detailed Submittal: After approval of the Preliminary Submittal, the CONTRACTOR shall submit the proposed detailed test procedures, forms, and checklists. This submittal shall include a statement of test objectives with the test procedures.
 - d. Certify in writing that for each loop or system checked out, and all discrepancies have been corrected.
4. Calibration Sheets: Each instrument calibration sheet shall provide the following information and a space for sign-off on individual items and on the completed unit:
- a. Project name
 - b. Loop number

- c. Tag number
 - d. Manufacturer
 - e. Model number
 - f. Serial number
 - g. Calibration range
 - h. Calibration data: Input, output, and error at 10, 50 and 90% of span
 - i. Switch setting, contact action, and deadband for discrete elements
 - j. Space for comments
 - k. Space for sign-off by Instrumentation Supplier and date
 - l. Test equipment used and associated serial numbers
5. Training Submittals: The CONTRACTOR shall submit a training plan that includes:
- a. Schedule of training courses including dates, durations, and locations of each class.
 - b. Resumes of the instructors who will actually implement the plan.
- D. Operations and Maintenance Information:
- 1. General: Operations and maintenance information shall be based upon the approved shop drawing submittals as modified for conditions encountered in the field during the Work.
 - 2. Operations and maintenance information submitted shall be organized as follows for each process:
 - a. Section A - Loop Drawings
 - b. Section B - Instrument Summary
 - c. Section C - Instrument Data Sheets
 - d. Section D - Sizing Calculations

- e. Section E - Instrument Installation Details
 - f. Section F - Test Results
3. CONTRACTOR-certified results from Calibration Loop Testing, Precommissioning, and Performance Testing shall be included in Section H of the operations and maintenance information.
- E. Record Drawings:
- 1. Keep current a set of complete loop and schematic diagrams which shall include all field and panel wiring, piping and tubing runs, routing, mounting details, point-to-point diagrams with cable, wire, tube and termination numbers. These drawings shall include all instruments and instrument elements. One set of record drawings electronically formatted in INTERGRAPH MICROSTATION format and 2 hard copies shall be submitted after completion of all Precommissioning tasks but before Performance Testing. All such drawings shall be submitted for review before acceptance of the completed Work.

1.5 FACTORY TESTING

- A. Arrange for the Manufacturers of the equipment and fabricators of panels and cabinets supplied under this Section to allow the ENGINEER to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the cabinets, special control systems, flow measuring devices, and other pertinent systems and devices. A minimum of 10 working days notification shall be provided to the ENGINEER before testing. No shipments shall be made without the ENGINEER's approval.

1.6 PERIOD FOR CORRECTION OF DEFECTS

- A. Correct all defects in the I&C upon notification from the CITY within one year from the date of Substantial Completion. Corrections shall be completed within 5 days after notification.

1.7 SYSTEM DESCRIPTION

- A. All instruments shall return automatically and immediately to accurate measurement upon restoration of power after a power failure, except where specifically noted.
- B. Provide and install two-wire transmitters in local panels or enclosures with receiver/indicator/retransmitter as required.
- C. Provide instrument transmitters which produce isolated 4-20 mAdc analog signals. Follow ISA-S50.1.
- D. For instruments which produce a pulse signal, use dc pulse frequency signals whose

repetition rate is directly proportional to the process variable over a 10:1 range. Use 24 Vdc power source.

- E. Provide instruments that are properly rated for the environment and conformably coated printed circuit boards to prevent damage by dust, moisture, fungus, and airborne contaminants.
- F. Provide instruments complete with mounting hardware, floor stands, wall brackets, or instrument racks.
- G. Use linear, direct reading indicators unless otherwise specified.

1.8 QUALITY ASSURANCE

- A. Provide instrumentation of rugged construction designed for the site conditions. Provide only new, standard, first-grade materials.
- B. Provide material and equipment in accordance with applicable codes and standards, except as modified by the specifications.
- C. Use single source manufacturer for each instrument type. Use the same manufacturer for different instrument types whenever possible.
- D. Coordinate instrumentation to assure proper interface and system integration. Provide signal processing equipment, to include, but not be limited to, process sensing and measurement, transducers, signal converters, conditioners, transmitters, receivers, and power supplies. Coordinate the various subcontractors, equipment suppliers, and manufacturers.

1.9 WARRANTY

- A. Warranty the instrumentation, materials, workmanship, and installation to be free from defects for a period of one year from the date of final acceptance of the equipment.
- B. Furnish and install replacement parts during the warranty period for any defective component at no additional cost. Replace spare parts consumed during the warranty period with new equipment at no additional cost, immediately after use, to restore the spare parts inventory.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Code and Regulatory Compliance: All I&C Work shall conform to or exceed the applicable requirements of the National Electrical Code and International Society of Automation. Conflicts between the requirements of the Contract Documents and any codes or

referenced standards or specifications shall be resolved with the more stringent requirement having precedence.

- B. Current Technology: All meters, instruments, and other components shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise required to match existing equipment.
- C. Hardware Commonality: All instruments that use a common measurement principle (for example, d/p cells, pressure transmitters, level transmitters that monitor hydrostatic head) shall be furnished by a single Manufacturer. All panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single Manufacturer.
- D. Loop Accuracy: The accuracy of each instrumentation system or loop shall be determined as a probable maximum error; this shall be the square-root of the sum of the squares of certified "accuracies" of the designated components in each system, expressed as a percentage of the actual span or value of the measured variable. Each individual instrument shall have a minimum accuracy of $\pm 0.5\%$ of full scale and a minimum repeatability of $\pm 0.25\%$ of full scale unless otherwise indicated. Instruments that do not conform to or improve upon these criteria are not acceptable.
- E. Instrument and Loop Power: Power requirements and input/output connections for all components shall be verified. Power for transmitted signals shall, in general, originate in and be supplied by the control panel devices. The use of "2-wire" transmitters is preferred, and use of "4-wire" transmitters shall be minimized. Individual loop or redundant power supplies shall be provided as required by the Manufacturer's instrument load characteristics to ensure sufficient power to each loop component. All power supplies shall be mounted within control panels or in the field at the point of application.
- F. Loop Isolators and Convertors: Signal isolators shall be provided as required to ensure adjacent component impedance match where feedback paths may be generated, or to maintain loop integrity during the removal of a loop component. Dropping precision wire-wound resistors shall be installed at all field side terminations in the control panels to ensure loop integrity. Signal conditioners and converters shall be provided where required to resolve any signal level incompatibilities or provide required functions.
- G. Environmental Suitability: All indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided in order to maintain all instrumentation devices 20% within the minimums and maximums of their rated environmental operating ranges. Provide all power wiring for these devices. Enclosures suitable for the environment shall be furnished. All instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.
- H. Signal Levels: Analog measurements and control signals shall be as indicated herein, and

unless otherwise indicated, shall vary in direct linear proportion to the measured variable. Electrical signals outside control panels shall be 4 to 20 mA DC except as indicated. All electric signals shall be electrically or optically isolated from other signals. All pneumatic signals shall be 3 to 15 psig with 3 psig equal to 0% and 15 psig equal to 100%.

- I. Control Panel Power Supplies: All power supplies shall have an excess rated capacity of 40%. The failure of a power supply shall be reported to the SCADA System. Backup power capacitors may be used to ensure SCADA system has sufficient time to react to status change.

2.2 OPERATING CONDITIONS

- A. The I&C shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:
 1. Environment – Coastal
 2. Temperature Range – 32 through 104 degrees F
 3. Thermal Shock – 1 degree F per minute, maximum
 4. Relative Humidity – 20 through 90%, non-condensing

2.3 SPARE PARTS AND SPECIAL TOOLS

- A. Spare Parts: Furnish the spare parts selected by the ENGINEER from the priced list of spare parts in the Instrument Submittal and Control Panel Engineering Submittal in conformance with Section 13370 - Control Panels
- B. Special Tools: Furnish a priced list of all special tools required to calibrate and maintain all of the instrumentation provided under the Contract Documents. After approval, furnish all listed tools.
- C. Timing of Submittals: All special tools and spare parts shall be submitted before startup starts, and shall be suitably wrapped and identified.

2.4 INTRUSION ALARM POSITION SWITCH

- A. Each intrusion alarm position switch shall transmit a signal when the monitored door or hatch is not in the closed position.
- B. The intrusion alarm position switch shall be the inductive proximity sensor type, designed to operate by generating a magnetic field and detecting the eddy current losses.
- C. The proximity sensor shall have a 30mm stainless steel barrel diameter with 0.59 inch nominal sensing distance (unshielded).
- D. NEMA 4X enclosure rating.

- E. Normally open output configuration.
- F. 10-30 VDC operating voltage, load current of 25 mA or less.
- G. Two wire operation with integral cable. Full PLC interface compatibility.
- H. Repeatability: 10 percent or better.
- I. Hysteresis: 15 percent or better.
- J. Protection for false pulse and transient noise.
- K. Integral LED output energized indicator.
- L. Correction factor as appropriate for target material.
- M. Stainless steel angle mounting bracket with spring-return for collision protection.
- N. Acceptable products: Allen-Bradley Bulletin 871TM series; or approved equal.

Tag No.	Service	NEMA Rating
ZS-100	Manhole No. 1	4X

2.5 FLOOD SWITCH

- A. Switch shall be a stem mounted float device with 304 stainless steel stem, Buna N Float Material, Lucite Slosh Shield, IMO/GEMS Model LS-270 or approved equal.

Tag No.	Service	NEMA Rating
LSHH-100	Manhole No. 1	4

2.6 COPPER TUBING AND CONNECTORS

- A. Copper tubing shall be ASTM B88 or 75, type K or L, Annealed temper (soft copper).
- B. Connectors shall be compression fitted and made of cast copper alloy, brass, or stainless steel. Cast copper alloy fittings shall comply with ASME/ANSI B16.26 specifications.
- C. Thread compounds and lubricants shall be used according to the manufacturer's recommendations. Teflon tape shall not be used.
- D. Copper tubing and connectors shall be Swagelock, Hoke or approved equal.

- E. Copper tubing supports shall be two hole mounted, made of 304 stainless steel, and have SBR rubber inserts. Use Mc Master-Carr catalog number 8981T25 or approved equal. Single hole rubber cushioned loop straps are not acceptable.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING

- A. Shipping Precautions: After completion of shop assembly, factory test, and approval, all equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the job site.
- B. Special Instructions: Special instructions for proper field handling, storage, and installation required by the Manufacturer shall be securely attached to each piece of equipment before packaging and shipment.
- C. Tagging: Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the I&C. Identification shall be prominently displayed on the outside of the package.
- D. Storage: Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the CONTRACTOR at no additional cost to the CITY. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through tests as directed by the ENGINEER. Such tests shall be at no additional cost to the CITY, and if the equipment fails the tests, it shall be replaced at no additional cost to the CITY.

3.2 MANUFACTURER'S SERVICES

- A. Manufacturer's services shall be furnished for the following equipment:
 - 1. All flow meters in new or potable water streams that relate to process control, mass balance calculations, and billing of customers.
 - 2. All process analyzers
 - 3. All hazardous gas detection equipment

4. Instruments that require specialized knowledge, such as vibration detectors.
- B. Furnish the following Manufacturer's services for the instrumentation listed above:
1. Perform bench calibration
 2. Oversee installation
 3. Verify installation of installed instrument
 4. Certify installation and reconfirm Manufacturer's accuracy statement
 5. Oversee loop testing, prepare loop validation sheets, and certify loop testing
 6. Oversee precommissioning, prepare precommissioning validation sheets, and certify precommissioning
 7. Train the CITY 's personnel
- C. INSTALLATION
1. General:
 - a. All instrumentation, including instrumentation furnished under other Divisions, shall be installed under Division 13 and the manufacturers' instructions.
 - (1) Equipment Locations: The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the CITY exercises the right to require changes in location of equipment that do not impact material quantities or cause material rework, make such changes without additional cost to the CITY
 - b. Conduit, Cables, and Field Wiring
 - (1) All conduit shall be provided under Division 16.

- (2) All 4-20 mA signal circuits, process equipment control wiring, signal wiring to field instruments, SCADA and PLC input and output wiring and other field wiring and cables shall be provided under Division 16.
 - (3) All SCADA and PLC equipment cables, data highway communication networks shall be provided under Division 13.
 - (4) All terminations and wire identification at I&C equipment furnished under this or any other Division shall be provided under Division 13.
- c. Instrumentation Tie-Downs: All instruments, control panels, and equipment shall be anchored by methods that comply with seismic requirements that apply to the site.

(1) Ancillary Devices: The Contract Documents show all necessary conduit and instruments required to make a complete instrumentation system. The CONTRACTOR shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements at no additional cost to the CITY . All such additions and all such changes, including the proposed method of installation, shall be submitted to the ENGINEER for approval before commencing the Work. Such changes shall not be a basis of claims for extra work or delay.

d. Installation Criteria and Validation: All field-mounted components and assemblies shall be installed and connected according to the requirements below:

- (1) Installation personnel have been instructed on installation requirements of the Contract Documents.
- (2) Technical assistance is available to installation personnel at least by telephone.
- (3) Installation personnel have at least one copy of the approved shop drawings and data.
- (4) All power and signal wires shall be terminated with crimped type lugs.
- (5) All connectors shall be, as a minimum, water tight.
- (6) All wires shall be mounted clearly with an identification tag that is of a permanent and reusable nature.

- (7) All wire and cable shall be arranged in a neat manner and securely supported in cable groups and connected from terminal to terminal without splices unless specifically approved by the ENGINEER. All wiring shall be protected from sharp edges and corners.
- (8) All mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.
- (9) Verify the correctness of each installation, including polarity of electric power and signal connections, and making sure all process connections are free of leaks. Certify in writing that for each loop or system checked out, all discrepancies have been corrected.
- (10) The CITY will not be responsible for any additional cost of rework attributable to actions of the CONTRACTOR or the Instrumentation Subcontractor.

D. LOOP TESTING

1. General: Individual instrument loop diagrams per ISA Standard S5.4 - Instrument Loop Diagrams, expanded format, shall be submitted to the ENGINEER for review before the loop tests. The CONTRACTOR shall notify the ENGINEER of scheduled tests a minimum of 30 days before the estimated completion date of installation and wiring of the I&C. After the ENGINEER's review of the submitted loop diagrams for correctness and compliance with the specifications, loop testing shall proceed. The loop check shall be witnessed by the ENGINEER.
2. Instrument and Instrument Component Validation: Each instrument shall be field tested, inspected, and adjusted to its indicated performance requirement in accordance its Manufacturer's specifications and instructions. Any instrument that fails to meet any Contract requirement, or, in the absence of a Contract requirement, any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the ENGINEER at no additional cost to the CITY .
3. Loop Validation: Controllers and electronic function modules shall be field tested and exercised to demonstrate correct operation. All control loops shall be checked under simulated operating conditions by impressing input signals at the primary control elements and observing appropriate responses of the respective control and monitoring elements, final control elements, and the graphic displays associated with the SCADA and PLC. Actual signals shall be used wherever available. Following any necessary corrections, the loops shall be retested.

Specified accuracy tolerances for each analog network are defined as the root-mean-square-summation of individual component accuracy requirements. Individual component accuracy requirements shall be as indicated by Contract requirements or by published manufacturer accuracy specifications, whenever Contract accuracy requirements are not indicated. Each analog network shall be tested by applying simulated analog or discrete inputs to the first element of an analog network. For networks that incorporate analog elements, simulated sensor inputs corresponding to 20, 40, 60, 80 and 100% of span shall be applied, and the resulting element outputs monitored to verify compliance to calculated root-mean-square-summation accuracy tolerance requirements. Continuously variable analog inputs shall be applied to verify the proper operation and setting of discrete devices. Provisional settings shall be made on controllers and alarms during analog loop tests. All analog loop test data shall be recorded on tests that include calculated root-mean-square-summation system accuracy tolerance requirements for each output.

4. Loop Validation Sheets: Prepare loop confirmation sheets for each loop covering each active instrumentation and control device except simple hand switches and lights. Loop confirmation sheets shall form the basis for operational tests and documentation. Each loop confirmation sheet shall cite the following information and shall provide spaces for sign-off on individual items and on the complete loop by the Instrumentation Supplier:
 - a. Project name
 - b. Loop number
 - c. Tag number, description, manufacturer and model number for each element
 - d. Installation bulletin number
 - e. Specification sheet number
 - f. Loop description number
 - g. Adjustment check
 - h. Space for comments
 - i. Space for loop sign-off by Instrumentation Supplier and date
 - j. Space for ENGINEER witness signature and date
5. Loop Certifications: When installation tests have been successfully completed for all individual instruments and all separate analog control networks, a certified

copy of all test forms signed by the Contractor's Engineer or the Engineer's representative. The test results shall contain a clear and unequivocal statement that all instrumentation has been successfully calibrated, inspected, and tested.

E. PRECOMMISSIONING

1. General: Precommissioning shall start after acceptance of all wire test, calibration tests and loop tests, and all inspections have demonstrated that the instrumentation and control system complies with all Contract requirements. Precommissioning shall demonstrate proper operation of all systems with process equipment operating over full operating ranges under conditions as closely resembling actual operating conditions as possible.
2. Precommissioning Procedures and Documentation: All precommissioning and test activities shall follow detailed test procedures and check lists accepted by the ENGINEER. All test data shall be acquired using equipment as required and shall be recorded on test forms accepted by the ENGINEER, that include calculated tolerance limits for each step. Completion of all system precommissioning and test activities shall be documented by a certified report, including all test forms with test data entered, delivered to the ENGINEER with a clear and unequivocal statement that all system precommissioning and test requirements have been satisfied.
3. Operational Validation: Where feasible, system precommissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges, and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under start-up and steady-state operating conditions to verify that proper and stable control is achieved using local field mounted control circuits. All hardwired and software control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady-state operation of final control elements running under the control of field mounted automatic analog controllers or software based controllers shall be assured by adjusting the controllers as required to eliminate oscillatory final control element operation. The transient stability of final control elements operating under the control of field mounted, and software based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any) and making necessary controller adjustments as required to eliminate excessive oscillatory amplitudes and decay rates.
4. Loop Tuning: All electronic control stations incorporating proportional, integral or differential control circuits shall be optimally tuned, experimentally, by applying

control signal disturbances and adjusting the gain, reset, or rate settings as required to achieve a proper response. Measured final control element variable position/speed set point settings shall be compared to measured final control element position/speed values at 20, 40, 60, 80 and 100% of span and the results checked against indicated accuracy tolerances.

5. Precommissioning Validation Sheets: Precommissioning shall be documented on one of two types of test forms as follows:
 - a. For functions that can be demonstrated on a loop-by-loop basis, the form shall include:
 - (1) Project name
 - (2) Loop number
 - (3) Loop description
 - (4) Tag number, description, manufacturer and data sheet number for each component.
 - (5) Space for sign-off and date by both the Instrumentation Subcontractor and ENGINEER.
 - b. For functions that cannot be demonstrated on a loop-by-loop basis, the test form shall be a listing of the specific tests to be conducted. With each test description the following information shall be included:
 - (1) Specification page and paragraph of function demonstrated
 - (2) Description of function
 - (3) Space for sign-off and date by both the Instrumentation Subcontractor and ENGINEER.
6. Precommissioning Certification: Submit an instrumentation and control system precommissioning completion report that shall state that all Contract requirements have been met and shall include a listing of all instrumentation and control system maintenance and repair activities conducted during the precommissioning testing. Acceptance of the instrumentation and control system precommissioning testing must be provided in writing by the ENGINEER before the performance testing may begin.

3.3 ONSITE SUPERVISION

- A. Furnish the services of an on-site service engineer to supervise and coordinate installation, adjustment, testing, and start-up of the I&C. The ENGINEER will be present during the total period required to affect a complete operating system. A qualified team of the Instrumentation Subcontractor personnel shall be on site for 8 hours to check all equipment, perform the tests indicated in this Section, and furnish startup services.

3.4 PERFORMANCE TEST

- A. The entire I&C shall operate for 7 days without failure.
- B. Furnish all necessary support staff as required to operate the system and to satisfy the repair or replacement requirements.
- C. If any component fails during the performance test, it shall be repaired or replaced and the I&C shall be restarted on another 7-day period.

3.5 TRAINING

- A. General: Train the CITY's personnel on the maintenance, calibration and repair of all instruments provided under this Contract.
- B. Instructions: The training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.
- C. Duration: Each training class shall be a minimum of 8 hours in duration and shall cover, as a minimum, operational theory, maintenance, troubleshooting/repair, and calibration of instruments.
- D. Schedule: Training shall be performed during the precommissioning phase of the project. The training sessions shall be scheduled a minimum of 3 weeks in advance of when the courses are to be initiated. The ENGINEER will review the course outline for suitability and provide comments that shall be incorporated.
- E. Agenda: The training shall include operation and maintenance procedures, troubleshooting with necessary test equipment, and changing set points, and calibration for that specific piece of equipment.
- F. Documentation: Within 10 days after the completion of each session the CONTRACTOR shall submit the following:
 - 1. List of all CITY personnel who attended the session.
 - 2. Evaluation of CITY personnel via written testing or equivalent evaluation.

3. Copy of the training materials used including all notes, diagrams, and comments.

3.6 ACCEPTANCE

- A. For the purpose of this Section, the following conditions shall be fulfilled before the Work is considered substantially complete:
 1. All submittals have been completed and approved.
 2. The I&C has been calibrated, loop tested and precommissioned.
 3. The CITY training has been performed.
 4. All required spare parts and expendable supplies and test equipment have been delivered to the ENGINEER.
 5. The performance test has been successfully completed.
 6. All punch-list items have been corrected.
 7. All record drawings in both hard copy and electronic format have been submitted.
 8. Revisions to the operations and maintenance manuals information that may have resulted from the field tests have been made and reviewed.
 9. All debris associated with installation of instrumentation has been removed.
 10. All probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition.

**** END OF SECTION ****

SECTION 13370

CONTROL PANELS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. General: The CONTRACTOR shall provide control panels, complete and operable, in accordance with the Contract Documents.
- B. The provisions of this Section apply to local control panels provided in equipment systems specified in other sections unless indicated otherwise in those sections.

1.2 RELATED SECTIONS

- A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, also apply to the extent required for proper performance of this Work:
 - 1. Section 13300 Instrumentation and Control
 - 2. Section 13374 Control Panel Instrumentation

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following commercial standards apply to the Work of this Section:
 - 1. ASTM A36 Specification for Carbon Structural Steel
 - 2. ASTM A283 Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
 - 3. NEMA ICS-1-101 Industrial Control Systems
 - 4. SSPC-SP6 Specification for the Society for Protective Coating B Commercial Blast
- B. Underwriters Laboratories (UL) Publication:
 - 1. 508 Industrial Control Equipment

1.4 CONTRACTOR SUBMITTALS

- A. Shop drawings shall be submitted in accordance with Section 13300 - Instrumentation and Control.
- B. Control Panel Engineering Submittal: The CONTRACTOR shall submit a Control Panel Engineering Submittal (CPES) for each control panel and enclosure provided under Division 13. The CPES shall completely define and document the construction, finish, layout, power circuits, signal and safety grounding circuits, fuses, circuit breakers, signal circuits, internally mounted instrumentation and SCADA system components, face plate mounted instrumentation components, internal panel arrangements, and external panel arrangements. All panel drawings shall be "B" size, and all data sheets and manufacturer specification sheets shall be "A" size. The submittal shall be in conformance with NEMA Standard ICS-1-1.01, shall be submitted as a singular complete bound volume or multi-volume package within 120 calendar days after Notice to Proceed and shall have the following content:
 - 1. A complete index shall appear in the front of each bound volume. Panels shall be indexed by system or process area, and drawings and data associated with a panel shall be grouped together. All panel tagging and nameplate nomenclature shall be consistent with the requirements of the Contract Documents.
 - 2. Scale construction drawings which define and quantify the type and gauge of steel to be used for panel fabrication, the ASTM A36 grade proposed for structural shapes and straps, panel door locks and hinge mechanisms, type of bolts and bolt locations for section joining and anchoring, details and proposed locations on the use of "Unistrut" members, stiffener materials and locations, electrical terminal box and outlet locations, electrical access locations, print pocket locations, writing board locations and lifting lug material and locations.
 - 3. Scale physical arrangement drawings which define and quantify the physical groupings comprising control panel sections, auxiliary panels, subpanels, and racks. Cutout locations with nameplate identifications shall be indicated.
 - 4. Front of panel layouts for all control panels.
 - 5. Schematic/elementary diagrams depicting all control devices and circuits and their functions.
 - 6. Wiring/connection diagrams locating and identifying electrical devices, terminals and interconnecting wiring. These diagrams shall show interconnecting wiring by lines, designate terminal assignments, and show the physical location of all electrical and control devices.
 - 7. Interconnection diagrams locating and identifying all external connections between the control panel/control panel devices and associated equipment. These diagrams shall

show interconnecting wiring by lines, designate terminal assignments, and show the physical location of all panel ingress and egress points.

8. Completed ISA-S20 data sheets for all instrumentation devices associated with each control panel, supplemented with manufacturer specification sheets which verify conformance to the requirements of the Contract Documents.
9. A bill of material which enumerates all devices associated with the control panel.
10. A priced listing of analog spare parts in conformance with Section 13300 - Instrumentation and Control.

1.5 SPARE PARTS AND SPECIAL TOOLS

- A. Control panel spare parts selected by the ENGINEER and special tools shall be provided in accordance with Section 13300 - Instrumentation and Control.
- B. All spare parts and special tools shall be submitted before startup commences, suitably wrapped and identified.

1.6 CERTIFICATION

- A. Each control panel shall bear the UL label. The UL label shall apply to the specific equipment supplied with the enclosure, and the installation and wiring of the equipment within and on the enclosure. If required for UL labeling, provide ground fault interrupters, isolation transformers, fuses, and any other necessary equipment, even though such equipment is not indicated on the Drawings. The fabricator shall be an approved UL listed manufacturer.
- B. The shop that builds the controller must be a UL 508A listed panel shop/fabricator/builder (certified & authorized by UL). This shop will then install a UL sticker of approval on the assembled controller. Otherwise UL or a UL listed third party is needed to inspect, evaluate the work, issue an evaluation report and install the UL approval sticker.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Environmental Suitability: All outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided in order to maintain all instrumentation devices no less than 20% below the maximum rated environmental operating level, and at least 20% above the minimum rated environmental operating level. The CONTRACTOR shall provide all power wiring for these devices. Enclosures suitable for the environment shall be furnished.

- B. The control panel controls shall be as shown on the drawings. Control conductors shall be provided in accordance with the indicated requirements.
- C. Each source of foreign voltage shall be isolated by providing disconnecting or pull-apart terminal blocks or a disconnect operable from the control panel front. Each control panel shall be provided with identified terminal strips for the connection of all external conductors. Provide sufficient terminal blocks to connect 25% additional conductors for future use. Discrete outputs from the control panel shall be provided by electrically isolated contacts rated for 5 A at 120 VAC. Analog inputs and outputs shall be an isolated 4-20 mA, 2-wire signals with power supply.
- D. Programmable Logic Controllers (PLCs) may be provided in lieu of relays if the programmable logic controllers match the PLCs provided under Section 13374 - Control Panel Instrumentation.
- E. All control panel mounted devices shall be mounted a minimum of 3 feet above finished floor elevation.
- F. Painting: The interior of the control panel, back-panel, and side-panel(s) shall have a white finish coat.

2.2 CONTROL PANELS

- A. Remote Control Panel RCP:
 1. Fabricate panels, install instruments, plumb and wire in the factory.
 2. Furnish termination panels, if required. Include terminal blocks; interface hardware, wiring, and cabling necessary for a complete system.
 3. Use panel fabrication techniques that allow for removal and maintenance of all equipment after installation.
 4. Provide equipment-mounting racks of standard construction and dimensions. Provide front access doors only unless specified otherwise. Provide space for internal wiring and for the connection of external wiring.
 5. Do not locate any equipment within bottom two inches of panel.
 6. All equipment located within the panel shall be rigidly secured.
 7. All outdoor panels shall be provided with breather/drain plugs.
 8. Provide a hasp on all enclosure covers (doors) for CITY furnished locks. The CITY will supply padlocks. Enclosures shall be 316 stainless steel. Provide single door NEMA type 4X with back panels.

9. Provide structural reinforcements within enclosures to insure a plane surface, to limit vibration and to provide rigidity during shipment, installation and operation without distortion or damage to the panel or to any instrument.
10. Grind and sand exterior welds to a smooth finish free of burrs. Make surfaces free of ridges, nuts, bolt heads and similar protrusions.
11. Internally, supply the enclosures with a structural steel framework or bracing for equipment support and enclosure bracing. Where two or more enclosures are shown mounted immediately adjacent to one another, bolt them securely together with their front faces parallel.
12. Provide each enclosure with full gaskets on covers.

B. Electrical Requirements:

1. Conduit, wireways, switches, wire, and electrical fittings shall be provided for all 115 V circuits to instruments and other electrical devices as required for a complete and operable installation.
2. Conduit, wireways, junction boxes, and fittings shall be provided for all signal wire, thermocouple, or resistance thermometer lead wire. Conduit or wireway runs shall include those required between temperature sensors and temperature transmitters and between the thermocouple wireway or junction box to instruments.
3. Each terminal connection shall have a plastic plate with a terminal and instrument tag number. All wiring shall be identified with stamped tubular wire and markers.
4. Panels shall be provided with two switched 500 lumen LED panel lights. Two lights shall be provided for every 4 feet of panel width and shall be mounted inside and in the top of the back-of-panel area.
5. The RCP shall be provided with a 15-A, 120-V, service outlet circuit within the back-of-panel area. The circuit shall be provided with 3-wire, 120-V, 15-A, duplex receptacles one for every 4 feet of panel width (one minimum per panel), spaced evenly along the back-of-panel area.
6. Wall mounted or pedestal mounted panels shall be so sized as to adequately dissipate heat generated by equipment mounted in or on the panel.
7. The RCP shall be provided with thermostatically controlled heaters that maintain inside temperature above 40 degrees F.
8. A door switch shall control two LED panel lights within the RCP.

9. Wiring methods and materials for all panels shall be in accordance with the NEC requirements for General Purpose (no open wiring) unless otherwise indicated.
10. Signal and Control Circuit Wiring:
 - a. Wire type and sizes: Conductor shall be flexible stranded copper machine tool wire UL listed Type MTW, and shall be rated 600 V. Wires for instrument signal circuits and alarm input circuits shall be No. 14 AWG. All other wires, including shielded cables, shall be No. 16 AWG, minimum.
 - b. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal using white numbered wire markers which shall be plastic-coated cloth, Brady Type B-500 or approved equal or shall be permanently marked by heat-shrink plastic.
 - c. Flexible conduit is not acceptable except when specifically approved by the ENGINEER in writing.
 - d. Conduit fittings shall be Crouse-Hinds cast fittings or approved equal.
 - e. Splicing of wires in conduits is discouraged. If permitted, splicing shall be approved by the ENGINEER and splices shall be soldered or pressure type crimped.
 - f. For case grounding, panels shall be provided with a 1/4-inch by 1-inch copper ground bus complete with solderless connector for one No. 4 AWG bare stranded copper cable. The copper cable shall be connected to a system ground loop.
11. DIN Rail Mounted Terminal Blocks:
 - a. Provide factory assembled terminal blocks on a mounting channel and bolt the channel to the inside of the panel. Space terminal block strips no closer than 6 inches center to center.
 - b. Provide screw type 600 V terminals with pressure plate to accept wire size #12 AWG and smaller. Do not use miniature terminal blocks.
 - c. Provide a continuous marking strip with the terminals. Provide a separate terminal for terminating each shield wire.
 - d. Reserve one side of each terminal strip for field incoming conductors. Do not make common connections and jumpers required for internal wiring on the field side of the terminal. Terminate no more than two wires at any one terminal.

- e. Provide a minimum of 25 percent spare terminals.
 - f. The terminal block shall terminate wires without additional preparation such as tinning of wire ends, special connectors, etc.
 - g. The insulation shall have wire entry funnels to facilitate insertion of wires.
 - h. The insulating housing shall prevent stray strands from shorting out adjacent terminal blocks.
 - i. The terminations shall be gastight to prevent corrosion.
 - j. Terminal screws shall be captive in the metal body or via the insulation housing.
 - k. Once tightened terminal screws shall be useable with accessories such as center or insertion bridges; test sockets; separating plates, end covers, etc.
 - l. Provide fusible terminal blocks with fuses and blown fuse indicators for each signal loop.
 - m. Manufacturer: Phoenix Contact or approved equal.
12. DIN Rail Mounted Circuit Breakers:
- a. Circuit breakers shall be 115 VAC, single pole as manufactured by Allen Bradley Series 1492-GH; or approved equal.
13. Relay Sockets:
- a. Sockets for control relays shall be rated 5 amperes. Terminal screws shall be on the "Pressure Screw" type. Sockets shall be mounted via DIN rail and related hardware. Sockets shall be as manufactured by Allen Bradley Series 700-HN101; or approved equal.
14. Control Relay:
- a. Magnetically held relays shall have one spare contact. Control relays shall have contacts rated for 10-ampere inductive load, 125 volts, with coil voltage, number of poles, and pole arrangement as indicated on the plans. Relays shall be of the indicating type. Provide Allen Bradley Series 700-HA; or approved equal.
15. Selector Switches and Indicating Lights:
- a. Selector switches and indicating lights shall be supplied by one manufacturer and be of the same series or model type.

- b. Type: Heavy duty, oil tight.
 - c. Selector switch contacts shall be rated for AC or DC current with devices simultaneously operated by the switch contacts but not less than 10 Amps resistive at 120 VAC/VDC continuous.
 - d. Indicating lights shall be rated for 120 VAC. Lamps shall be high visibility LED type, long life (20,000 hours minimum). Indicating lights shall be push- to-test.
16. Electrical Locations:
- a. Terminal boxes for incoming and outgoing signal leads shall be located at the top or bottom of the panel as indicated or as otherwise required.
17. Power Supply Wiring:
- a. Unless otherwise indicated, all instruments, alarm systems, and motor controls shall operate on 24 VDC.
 - b. At a location near the top of the panel (or bottom), the panel fabricator shall provide terminal box connections for the main power supply entry.
 - c. Instruments located on the same panel section and serving the same process unit may be connected to a common branch circuit from the power supply. The number of circuits depends on the circuit load as indicated. Different panel sections or different process units shall not use common branch circuits. When instruments are not equipped with integral fuses, fuses shall be provided as required for the protection of individual instruments against fault currents. Fuses shall be mounted on the back of the panel in a fuse holder, and each fuse shall be identified by a service name tag.
 - d. Each potentiometer type instrument, electronic transducer, controller, or analyzer shall have an individual disconnect switch. Disconnect switches shall have metal or plastic tags indicating instrument tag numbers. Individual plug and cord set power supply connections may be used without switches when indicated.
18. Alarm Wiring: The panel vendor shall provide all alarms including light cabinets, audible signal units, test and acknowledge switches, and remote logic units as indicated. Interconnecting wiring to panel mounted initiating devices shall also be wired by the panel vendor. The wiring from external initiating devices shall be provided by the installation contractor. Where plug and cord sets are provided for component interconnection, the panel vendor shall harness and support the cables in neat and orderly fashion. Where separate wire is required, panel vendor shall install No. 16 AWG with THWN or THHN insulation between all components.

19. Signal Wiring:

a. Signal Wire - Non Computer Use:

(1) Signal wire shall be twisted pair or triads in conduit or troughs. Cable shall be constructed of No. 16 AWG copper signal wires with THWN or THHN insulation.

(2) Color code for instrument signal wiring shall be as follows:

Positive (+): Black
Negative (-): White

(3) Multiconductor cables where indicated shall consist of No. 16 AWG copper signal wires twisted in pairs, with 90-C, 600-V fault insulation. A copper drain wire shall be provided for the bundle with a wrap of aluminum polyester shield. The overall bundle jacket shall be PVC.

b. Multi-conductor cables, wireways and conduit shall be sized to allow for 10% spare signal wire.

20. 24 VDC Power Supply:

a. Panels shall be equipped with a linear 24 volt D.C. power supply for driving current loops and other D.C. powered equipment. It shall be solidly mounted, labeled and located in plain view oriented for ease of maintenance. Unit shall be sized based on 200% of load requirements of equipment actually furnished. 24 VDC power supply shall be SITOP order No. 6EP3334-8SB00- 0AY0, 120/230 Vac input, 24 Vdc output, 10A (12A up to +45°C), with 3% +/- voltage regulation from no-load to full-load.

21. UPS System:

a. The UPS system shall be Siemens DC UPS module SITOP UPS500S – 24V / 15A, RFI specification – class B (or approved equal), and Degree of protection – IP20. Output current rated value shall be 15A and charge current approximately 1A.

(1) Basic Unit Order No. 6EP1 933-2EC51; Qty. 1.

(2) Expansion Module Order No. 6EP1 935-5PG01; Qty. 5.

C. Labor and Workmanship: All panels shall be fabricated, piped and wired by fully qualified workmen who are properly trained, and supervised.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Preparation and Shipping:

1. Crate panels for shipment using a heavy framework and skids. The panel sections shall be cushioned to protect the finish of the instruments and panel during shipment. All instruments which are shipped with the panel shall further have suitable shipping stops and cushioning material installed to protect parts which could be damaged due to mechanical shock. Each separate panel unit shall be provided with removable lifting lugs to facilitate handling.
2. All shipments shall be by air ride van, unless otherwise indicated.
3. All control panel testing and inspection shall be performed before shipping.

B. Control panels shall be installed in accordance with Section 13300 - Instrumentation and Control.

3.2 CONTROL PANEL SIGNAL AND CONTROL CIRCUIT WIRING

A. Wiring Installation: All wires shall run in plastic wireways except for the following:

1. Field wiring.
2. Wiring between mating blocks in adjacent sections.
3. Wiring to panel-mounted components.

B. Wiring to Rear Terminals: Wiring to rear terminals on panel-mount instruments shall be in plastic wireways secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.

C. Shop drawings shall show conformance to the above wiring installation requirements.

D. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal using white numbered wire markers which shall be plastic-coated cloth, or permanently marked heat-shrink plastic.

E. Wires shall be fitted with a crimp type spade lug of the proper size at screw terminals except in the cases of termination fittings designed for compression or solder type termination. There shall be at least 2 inches of unencumbered wire extending from any point of attachment within the panel. Wire numbers shall be located within 1 inch of the point of attachment and shall be applied such that the number can be read from the front of the panel without rotating the wire. No more than two wires shall be located at any point of termination, including terminal blocks (terminal blocks specified are designed to accept two points of termination at each side).

- F. Wires shall be routed through Panduit brand wireway of the size shown on the drawings. Routing shall separate 24 Vdc paths from 120 Vac paths as far as possible. Wireway shall be secured to the removable back panel by multiple pan head screws of the proper size at intervals of one at every other mounting hole station provided by Panduit. The mounting hole station shall be completely utilized at the extreme ends of each wireway segment. Within wireway, wire bundles shall be loosely bound with individual plastic tie wraps at intervals of approximately two feet.

- G. External to wireway, wire shall be bundled neatly and secured with plastic tie wraps at intervals of approximately 8 inches. Wire splicing within the Instrument Panel is not acceptable.
 - 1. Wiring color code shall be as shown in this subsection
 - a. Blue: 24vdc +
 - b. Brown: 24vdc B
 - c. White: 120vac common
 - d. Black: 120vac power
 - e. Red: 120vac control power
 - f. Green: ground
 - g. Violet: 12vdc +
 - h. Yellow: 12vdc B
 - i. Belden black (+)
 - j. Belden clear (-)

- H. Panels shall be fitted with a duplex electrical outlet as shown on the drawings. Illumination at the panel interior shall be by LED panel lights operated by a door switch. Provide a door switch wired to the terminal blocks, as shown on the drawings, to indicate when the RCP door is open.

- I. Legend plates shall be laminated plastic or phenolic, black over white engraved by removing black material to reveal white letters. Lettering shall be sharp and clear, 3/16" nominal height. Engraving which is not uniform either letter to letter or within each character will not be accepted. Tags identifying interior components shall be affixed to the cabinet back panel.
 - 1. The following interior components shall be labeled with phenolic tags:
 - a. Low voltage relay

- b. Control relays
- c. Modicon PLC
- d. Microwave Data Systems Radio
- e. AC line surge arrestor
- f. DC UPS
- g. DC power supply
- h. Each terminal strip

3.3 CALIBRATION, TESTING, AND INSTRUCTION

A. General: Calibration, testing, and instruction shall be performed in accordance with Section 13300 - Instrumentation and Control.

B. Inspection and Approval:

1. The panel fabricator shall conduct the following tests before shipment:
 - a. All alarm circuits rung out to determine their operability.
 - b. All electrical circuits checked for continuity and where applicable, operability.
 - c. All nameplates checked for correct spelling and size of letters.
 - d. Any other test required to place the panel in an operating condition.
2. The CONTRACTOR shall furnish all necessary testing devices and sufficient manpower to perform the tests required by the ENGINEER.
3. If the above tests have not been performed before shipment, the CONTRACTOR shall be liable for back charges by the ENGINEER for the extra time required for inspections.
4. Each control panel shall be tested in the field for functional operation after the connection of external conductors, and before equipment startup.

**** END OF SECTION ****

SECTION 13374

CONTROL PANEL INSTRUMENTATION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The CONTRACTOR shall provide all control panel instrumentation, complete and operable, in accordance with the Contract Documents.
- B. The Contractor shall provide PLC Programming for the project.

1.2 RELATED SECTIONS

- A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, also apply to the extent required for proper performance of this Work:
 - 1. Section 13300 Instrumentation and Control
 - 2. Section 13370 Control Panels

1.3 CONTRACTOR SUBMITTALS

- A. Shop drawings, information, and data sheets shall be submitted in conformance with the requirements of Section 13300 - Instrumentation and Control and Section 13370 - Control Panels.
- B. Submit a preliminary copy of all documentation with the Factory Test procedure submittal. Submit both hard and electronic "as built" documentation with the final O&M manual submittal.

1.4 GENERAL REQUIREMENTS

- A. Provide a PLC system as shown on the drawings and detailed in these specifications. Provide all I/O (analog and discrete), interface modules, and other cabling and hardware as needed to provide a fully functioning system meeting these specifications.
- B. All software integration and configuration work on the project is to be completed by the approved Instrumentation Subcontractor, unless otherwise noted. Minimum Instrumentation Subcontractor qualifications are detailed in Section 13300 Instrumentation and Control.

- C. Provide comprehensive documentation of the program logic, as required in Section 1.6.C - Original Disks and Software Backups.

1.5 SOFTWARE LICENCES

A. General

1. Provide the City a non-exclusive, fully paid, perpetual license to use all the software supplied as part of this contract.
2. Provide unlimited license for all Application Software developed or configured by the Instrumentation Subcontractor for this project. Unlimited to mean the City has the right to:
 - a. Use, duplicate and modify the software in any manner, in whole or in part.
 - b. Use the software in any quantity, with any type of equipment, and for any purpose.
 - c. To make back-up copies of all software.

B. Software updates

1. Provide the City with 12 months free software updates and technical support for all manufacturer's software supplied as part of this project.
2. Upgrades and patches shall be installed by the Instrumentation Subcontractor. Schedule upgrades with the CITY.
3. The Instrumentation Subcontractor to test system after upgrade.

1.6 PLC LOGIC AND DOCUMENTATION

A. Logic Configuration shall be:

1. Logically set out in a modular format to follow the process flow.
2. Have all analogs scaled to CITY units (e.g. gpm, psi etc.) and annotate with the units where ever it is used in the program.

B. Logic Documentation:

1. Contractor is responsible for PLC & device programming. Make maximum

use of the documentation facilities which come as part of the Unity Pro programming environment.

2. Use mnemonic signal and variable names that reflect the signal/variable function.
 3. To provide good readability, make full use of the allowable number of characters in a signal or variable name. Excessively contracted naming that detracts from readability will not be accepted.
 4. Provide a title and short English description at the start of each new strategy that explains the purpose of the logic that follows, and how it functions.
 5. For each sub-section of logic within a strategy, provide a comment which explains to another programmer, the functionality of the logic. The purpose is to assist the reader with understanding the intent of the logic.
 6. Provide a title, revision number, date, and page number on every page of logic.
- C. Original Disks and Software Backups: Provide the CITY with:
1. Original disks for all standard Manufacturer's software supplied.
 2. An electronic back-up copy of all "as built" software configured by the Instrumentation Subcontractor.
 3. A record of all device hardware/ software configuration settings including IP addresses used.
 4. A copy of all software licenses with the City named as the software owner.
 5. Provide CITY with an unrestricted and current software disk of Unity Pro by Schneider Electric.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The PLC system shall operate in ambient conditions of 32 to 140°F temperature and 5 to 95 percent relative humidity without the need for purging or air conditioning
- B. PLC system shall be designed with high noise immunity to prevent occurrence of false logic signals resulting from switching transients, relay, and circuit breaker noise or conducted and radiated radio frequency interference.

- C. The controller shall be grounded to the panel ground bus with a separate ground conductor sized per the manufacturers grounding requirements.
- D. Programming software: PLC Program should be written in current version of Unity Pro by Schneider Electric; no equals.

2.2 PROGRAMMABLE LOGIC CONTROLLERS

- A. The microcontroller system and subsystem components shall be Modicon Momentum Unity M1 Series, or approved equal.
- B. Construction: The microcontroller shall be of solid-state design. All CPU operating logic shall be contained within an integral control chassis. Microcontroller terminal base units shall allow for the easy removal and replacement of the controller. The controller shall be capable of operating in a hostile industrial environment without fans, air conditioning, or electrical filtering (up to 60 degrees C and 95 percent humidity).
- C. The PLC shall be a Modicon Momentum Unity M1 processor, or approved equal, of the latest design with conformal coating, consisting of the following individual components:
 - 1. Modicon Momentum, M1 Processor Adaptor; Part No. 171CBU98091.
 - 2. Modicon Momentum, Interbus Communications Adapter; Part No. 170INT11000C.
 - 3. Modicon Momentum, 8 Channel 4-20mA Differential Analog Input I/O Base; Part #170AAI03000C.
 - 4. Modicon Momentum, 24 VDC 16 point Discrete Input and 24 VDC 16 point Discrete Output I/O Base; Part #170ADM35010C.
 - 5. Modicon Momentum, Interbus Cable; Part #170MCI00700.
 - 6. Modicon Momentum, Terminal Block; Part #170XTS00100.

PART 3-- EXECUTION

3.1 GENERAL

- A. Seven Day Acceptance Test: After start-up has been completed, the System shall undergo a 7-day acceptance test. The System shall run continuously for 7 consecutive days. During this period, all System functions shall be exercised. Any System interruption and accompanying component, subsystem, or program failure shall be logged for the cause, time of occurrence and duration of each failure. A failure

shall cause termination of the 7-day acceptance test. When the cause of a failure has been corrected, a new 7-day acceptance test shall be started.

- B. Each time the CONTRACTOR's technician is required to respond to a System malfunction, a report shall be prepared which includes details on the nature of the complaint or malfunction and the resulting repair action required and taken.

3.2 PLC PROGRAMMING REQUIREMENTS

- A. The Instrumentation Subcontractor shall program the PLC such that it will communicate as specified with both the Central HMI.

3.3 CONTROLLER TUNING

- A. Tuning of closed loop controllers
 1. Tune PID controllers by adjusting the proportional and integral gain parameters to provide a first over shoot of approximately 10 to 15%, and to provide a short settling time.
 2. Where cascade loops are used, tune the innermost loop first, and then the loop outside it. To provide stability ensure that the closed loop response of an outer loop is 5 to 8 times slower than the inner loop.
- B. Document closed loop response
 1. After final tuning of each loop provide trend graphs showing loop response to a 5% change in setpoint, and a 5% upset in controlled variable.
 2. Submit annotated loop response graphics with the Operations manual. Provide a title for each graphic and note tuning parameters used on each sheet.

**** END OF SECTION ****

SECTION 13390

COMMUNICATIONS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The Work of this Section includes providing a complete and operational communication system between the remote project facilities and the existing Water Operations Control Systems Center. The system shall include interface hardware, modules, radio, communication bridges, and application software necessary for a communication network.
- B. The Work, equipment, and services required by this Section shall be provided and furnished by the Communication System Subcontractor.

1.2 RELATED SECTIONS

- A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.
 - 1. Section 13300 Instrumentation and Control
 - 2. Section 13370 Control Panels
 - 3. Section 13374 Control Panel Instrumentation
 - 4. Section 16010 Basic Electrical Requirements

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. The Work of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego:
 - 1. Uniform Fire Code
 - 2. National Electrical Code
- B. Except as otherwise indicated, the current editions of the following standards apply to the Work of this Section:

- | | | |
|----|-----------------|---|
| 1. | ISA RP 55.1 | Hardware Testing of Digital Process Computers |
| 2. | NEMA ICS-6 | Enclosures for Industrial Controls and Systems |
| 3. | MIL Q STD 9858A | Quality Program Requirements |
| 4. | MIL STD 2170 | Reliability Prediction of Electronic Equipment |
| 5. | IEEE 802.2 | Reliability Prediction of Electronic Equipment |
| 6. | SAMA PMC-32 | Logical Link Control |
| 7. | SAMA PMX-32.1 | Process Instrumentation Reliability Terminology |

1.4 CONTRACTOR SUBMITTALS

- A. Shop drawings of all products listed in Part 2 of this Section shall be submitted.

1.5 ENVIRONMENTAL CONDITIONS

- A. The communication systems shall be designed and constructed for operation under the following environmental conditions:
 - 1. Equipment outdoors, coastal environment:
 - a. Temperature range: 32 through 104 degrees F
 - b. Thermal shock: two degree F per minute maximum
 - c. Relative humidity: 20 through 90%

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.
- B. Storage: Products shall be carefully stored in a manner recommended by the manufacturer in an area that is protected from the elements.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Where there is more than one item of similar equipment being furnished under this Section, all equipment of the same type shall be the product of a single manufacturer.

- B. All components shall be the most recent field proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise indicated.
- C. All instrumentation shall be suitable for operation in the ambient conditions at the equipment installation locations. Heating, cooling, and dehumidifying devices shall be incorporated with the outdoor instrumentation in order to maintain it within its rated environmental operating ranges. The Communication System Contractor shall provide all power wiring for these devices.
- D. The Communication System Contractor shall coordinate the installation of the communication system with all applicable utility companies and regulatory agencies having jurisdiction to secure approvals and permits which are required.

2.2 RADIO TELEMETRY

- A. Licensing and Surveying:
 1. The CITY has FCC licensing for the sites included in this project. The license allows the CITY to operate 928-952 MHZ frequencies for multiple address systems (MAS). The equipment provided shall be suitable for use on the assigned frequencies.
 2. The sites included in this Contract have been surveyed and are included in the radio feasibility study performed by the CITY. The results of this survey indicate reliable radio communications can be implemented between the central station and remote sites. The report is available to the Communication System Contractor from the ENGINEER.
 3. Before installation of the radio equipment, the Communication System Contractor shall verify that the radio paths are still reliable based on the present terrain and structure conditions. Any structures or other objects that may obstruct the radio paths or cause transmission or path fade margin problems shall be brought to the ENGINEER's attention immediately.
- B. Transmission: RF transmitters shall be directly frequency modulated by a built-in digital modem from the digital data stream furnished by the central computer system. RF receivers shall provide a digital data stream to the central computer system. Each assembly shall be capable of transmitting and receiving data at a rate of 9600 baud over a 928-952 MHz FCC assigned channel.
- C. Fixed Frequency Radio: The fixed frequency radio in the RCP shall be capable of processing data for transmission via an antenna system. The contractor shall install the fixed frequency radio inside the RCP Cabinet. The radio equipment and accessories shall be mounted on a single panel supplied by the manufacturer. General Electric Digital Energy MDS model SD09MD-CES- NNSNN shall be furnished by the CONTRACTOR.

1. General:
 - a. Frequency Range: 928-960MHz
 - b. Channel Bandwidth: Configurable for 25KHz or 12.5KHz
 - c. Operating Mode: Half Duplex
2. The City shall be responsible for configuring each data radio to interface with the PLC controller or SCADA system as required.

D. Yagi Antenna System

1. The Yagi antenna is a Scala TY-900. Antenna system shall be provided complete and functional for the intended use. System shall include antennas, mounting masts and hardware, grounding rods and accessories, and coaxial cables with connectors. Antenna heights shall be based on the radio survey and shall not exceed FCC limitations.
2. Antenna mounting components and hardware shall be hot-dip galvanized steel, stainless steel, or aluminum. Aluminum antennas or mounting components shall be anodized. Lightning suppressors shall be provided on antenna coaxial feed lines.
3. Antennas and antenna poles shall be mounted as indicated.
4. Antenna connections and openings shall be sealed and weatherproofed.
5. Antenna shall be suitable for use on the assigned radio frequency and shall have the gain required for reliable communications. The antennas for all remote sites shall be heavy duty YAGI type meeting the following requirements:

Frequency range	-	890 to 960 MHZ
Forward gain	-	12 Db
Front-to-back ratio	-	>20 Db
VSWR	-	<1.5 to 1.0 maximum
Polarization	-	Horizontal or Vertical
Impedance	-	50 ohms
Horizontal beamwidth - power	-	48 degrees (half power point) Input
	-	100 W Maximum
Wind rating	-	150 mph survival (no ice)
Lighting protection	-	Direct ground
Input connector	-	N female

6. Antenna feed lines shall be 1/4-inch low loss coax for remote sites. Feed lines shall be routed to radio transceivers through conduit or inside the antenna mast.

Provide Andrew Superflex FSJ1-50A. Coax connectors shall be 1/4-inch male N, Andrew F1PNM-H (QTY 2). Crimp style male N connector shall be Amphenol RFX (QTY 2). Jumper coax shall be RG58U 50 ohm dual shield solid center conductor.

7. Transmission lines and the antenna system shall be grounded as indicated on the drawings.
8. The lightning arrestor is a Polyphaser IS-B50LN-C2.

2.3 NAMEPLATES, TOOLS AND SPARE PARTS

- A. Tools: The Work includes all tools required to repair, calibrate, program, and maintain the equipment.
- B. Test Equipment: It is intended that the diagnostic software furnished with the system shall be able to troubleshoot communications to the circuit board level and that local repairs will be limited to board replacement. Any special diagnostic tester required to perform troubleshooting to this level shall be furnished. A portable calibrator for the radio system shall be furnished.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: The Communication System Contractor shall employ installers who are skilled in the installation and connection of all the elements, accessories and assemblies of communication systems.
- B. Access: All equipment shall be provided as indicated, or, if not indicated, so that it will be readily accessible for operation and maintenance. The ENGINEER reserves the right to require minor changes in equipment location before roughing in without any additional cost to the CITY.
- C. Review: The Communication System Contractor shall review the existing site conditions and examine all shop drawings for equipment in order to determine exact routing and final terminations for all wiring and cables. Exact routing shall be shown on the Record Drawings.
- D. Installation and Connection: The Communication System Contractor shall install and connect all field-mounted components and assemblies and as recommended by the manufacturer and as indicated.
- E. Conduits: In building interior locations, conduits shall be surface mounted on walls or ceilings wherever possible and parallel to building lines. Conduit shall not be routed on floors unless indicated otherwise. In exterior locations, conduit shall be routed below grade. Existing concrete or asphalt slabs shall be sawcut, conduit installed, and the cut repaired to

original condition. Exposed conduit and raceway shall be installed perpendicular or parallel to building lines.

- F. Final Checks: Final check of the communication systems shall be performed as an integral part of the system specified in Section 13300 - Instrumentation and Control.

3.2 FIELD TESTING

- A. RF Equipment Testing: The following measurements shall be made, recorded and compared to normal reading on each RF assembly prior to system testing to ensure that all equipment meets published specifications:
 1. Operating voltages
 2. Transmitter frequency
 3. Transmitter output power (at output of duplexer)
 4. Transmitter deviation
 5. Receiver local oscillator frequency
 6. Receiver sensitivity (10 to -6 BER)
- B. Testing: All systems furnished under this Contract shall be exercised through operational tests in the presence of the ENGINEER in order to demonstrate compliance with requirements. The testing of the communication system shall be performed in accordance with and as an integral part of the testing of the instrumentation and control specified in Section 13300 - Instrumentation and Control.

**** END OF SECTION ****

SECTION 13414

INSERTION MAGNETIC FLOWMETER

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section describes the requirements of four-wire type insertion magnetic flowmeter.
- B. Related sections include:
 - 1. Section 13300 –Instrumentation and Control.

1.2 SUBMITTALS

- A. Provide catalog data/shop drawings for all products listed in Part 2.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide instruments that are capable of meeting the following performance requirements when installed in accordance with the manufacturer's recommendations:
 - 1. Accuracy: +/-0.2 percent of flow rate.
 - 2. Pipe Sizes: 8 to 320 inches nominal bore.
 - 3. Conductivity: Greater than 50µS/cm.
 - 4. Temperature Range: 32 to 140 degrees F.
 - 5. Maximum Pressure: 295 psi

PART 2 -- PRODUCTS

2.1 INSERTION MAGNETIC FLOWMETER

- A. Insertion Magnetic Flowmeters are acceptable provided that the manufacturer's recommendations are met for the installation.
 - 1. Submittal must include manufacturer's straight pipe length recommendations.
- B. Acceptable manufacturers:

1. ABB AquaProbe FEA100 with WaterMaster converter.
2. McCrometer FPI395L with M-Series converter.
3. Or approved equal.

C. Materials:

1. Stainless Steel body.
2. All wetted materials compatible with potable water.

D. Design:

1. Operating pressure: 2-80 psi.
2. Operating temperature: 10-70 Deg F.
3. All components on the flow pipe must be submersible, including cable connections.
4. Provide cable between magnetic flow meter and transmitter/converter. Cable shall be of sufficient length to meet field requirements without splices.
5. Adjustable low flow cutoff.
6. Empty pipe alarm.

E. Signal Converter:

1. Provides excitation to sensor, Pulsed DC magnetic field excitation.
2. Configure to display flow volume in engineering units: CFS and tenths.
3. Powered by 24 VDC.
4. 4-20mA signal output.

F. Provide grounding recommended by the manufacturer.

Tag No.	Service	Pipe Size	Range	Drawing
FIT-100	Manhole No. 1	48 inches	TBD	E-2

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Keep foreign matter out of the system.
- C. Instrument Mounting:
 - 1. Mount all instruments where they will be accessible from fixed ladders, platforms, or grade.
 - 2. Mount all local indicating instruments with face forward toward the normal operating area, within reading distance, and in the line of sight.
 - 3. Mount instruments level, plumb, and support rigidly.
- D. Flowmeter shall be calibrated and tested per manufacturers recommendations.

PART 4 -- PAYMENT

The Lump Sum bid price for "Electrical Work – Insertion Meter" shall include full compensation for doing all work involved installing, calibrating and testing the insertion magnetic flowmeter and all work shown on the electrical drawings and in the related specification sections.

****END OF SECTION****

SECTION 13430

PRESSURE TRANSMITTER

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section describes the requirements of two-wire type pressure transmitters.
- B. Related sections include:
 - 1. Section 13300 –Instrumentation and Control.

1.2 SUBMITTALS

- A. Provide catalog data for all products listed in Part 2.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide instruments that are capable of meeting the following performance requirements when installed in accordance with the manufacturer's recommendations:
 - 1. Accuracy: +/-0.10 percent of calibrated range.
 - 2. Repeatability: +/-0.05 percent of calibrated range.
 - 3. Drift: Less than +/-0.5 percent of span for a six month period.
 - 4. Temperature Effect: Less than +/-0.05 percent per one degree F. of span from -30 to 150 degrees F.
 - 5. Rangeability: 40 to 1
 - 6. Configurations: Gage Pressure

PART 2 -- PRODUCTS

2.1 PRESSURE TRANSMITTER

- A. Meet the following unless otherwise noted on the instrument schedule:

1	Mounting:	Provide stainless steel mounting hardware.
2	Power Supply:	12-45 Vdc
3	Output:	4-20 mAdc into 1500 ohms load. Linear output for gage pressure and square root output function for differential pressure.
4	Zero Suppression or Range Elevation:	150 percent of calibrated span
5	Range:	9 – 360 psi
6	Maximum Static Pressure:	2,300 psig.
7	Humidity:	10 to 100 percent Relative Humidity.
8	Sensing Element:	Diaphragm type.
9	Vent/Drain position:	Upper, one for each sensing cavity.
10	Material:	Sensing element components to be 316 stainless steel. NEMA 4X electronic enclosure
11	Process Connection:	0.5 inch 14 NPT
12	Electrical Connector:	0.5 inch 14 NPT.
13	Identification plate:	316 SST plate with site mnemonic, tag and loop numbers. Use SST wire to fasten plate to instrument for easy viewing.
14	Indicator:	4-1/2 alphanumeric LCD.
15	Design:	Provide microprocessor-based electronic design with HART protocol digital communication.
16	Manufacturer:	SMAR model LD301 or approved equal.

- B. Provide gage pressure transmitters for pipeline. Provide differential pressure transmitters for flow measurement.

Tag No.	Service	Range	Drawing
PIT-100	Manhole No. 1	TBD	E-2

2.2 ACCESSORIES

- A. Provide 2-valve manifold and pipe mount bracket for each transmitter.

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. Install the transmitter in an orientation where the sensing diaphragms are in a vertical plane.
- B. Allow sufficient clearance overhead for cover removal and around the transmitter to provide an access for necessary adjustments.
- C. Where transmitters are located below the pressure tap slope horizontal lines (tubing) a minimum of one inch per foot downward from the pressure taps.
- D. Where transmitters are located above the pressure tap slope horizontal lines a minimum of one inch per foot upward from the pressure tap.
- E. Pressure lines from the tap location to the transmitter shall not have changes in elevation that trap air in the line.
- F. Assemble screwed fittings with Teflon paste or compatible metallic paste on the external threads. Teflon tape shall not be used.
- G. Local output indicators to be easily accessed for viewing and service by operations personnel.

****END OF SECTION****

SECTION 15102

TRIPLE OFFSET METAL SEATED BUTTERFLY VALVE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes materials, manufacturing, coating, testing, and shipping of metal- seated triple-offset butterfly valve and manual actuator in conformance with AWWA Standard C504, as modified herein.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS AND ABBREVIATIONS

- A. The applicable portions of the following standards shall apply to the valve. The latest standard shall apply unless otherwise noted.

ANSI B16.34 Valves – Flanged, Threaded, and Welding End ANSI B16.47 Large Diameter Steel Flanges

ANSI 6D Specification for Pipeline Valves (Seat Leakage) ANSI B1.20.1 Pipe Threads, General Purpose (inch) ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings ANSI B46.1 Surface Texture

API 598 Valve Inspection and Testing

AP 609 Butterfly Valves: Double-Flanged, Lug- and Wafer-Type

ASME B16.5 Pipe Flanges and Flanged Fittings: See also ASME B16.47 Series A (MSS- SP-44) or Series B (API 605)

ASME B16.10 Face-to-Face Dimensions

ASME B16.34 Valves – Flanged and Buttwelded End ASME B16.47 Large Diameter Steel Flanges

ASME B31.1 Power Piping ASME B31.3 Process Piping

ASME Standards Materials of Construction ASTM A182 Stainless Steel Forgings

ASTM A216 Carbon Steel Castings

AWWA C207 Standard for Steel Pipe Flanges for Waterworks Service

AWWA C213 Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines

ISO 5211/1 Part-Turn Valve Actuator Attachment Part 1: Flange Dimension
Part 2: Flange and Coupling Performance Characteristics

ISO 5752 Face-to-Face Dimensions Series 13 (Class 150) Series 14 (Class 300/600)

MSS-SP-6 Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings

MSS-SP-25 Standard Marking System for Valves, Fitting, Flanges, and Unions

MSS-SP-55 Quality Standard for Steel Castings for Valves, Flanges, and Fittings, and Other Piping Components

NSF-61 National Sanitation Foundation Standard 61-Drinking Water System Components - Health Effects (revised 10/88)

OSHA Occupational Safety and Health Act of 1970, as amended SAE Society of Automotive Engineers

UL Underwriters Laboratories, Inc.

1.3 SUBMITTALS

- A. Submit six copies of shop drawings. Indicate on each shop drawing submittal the name of the project, the name of the Vendor, and the names of any manufacturers and subcontractors. Provide on each shop drawing submittal the following Certification Statement, signed by the Vendor:

"Certification Statement: By this submittal, I hereby represent that I have determined and verified all materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable submittals and other requirements of the contract documents."

- B. The shop drawings shall include manufacturer's catalog data, calculations and detail construction sheets showing all valve parts and describing each part by material of construction, specification (such as ANSI, ASTM, SAE, or CDA) and manufacturer's part number. Identify each valve by tag number to which the catalog data and detail sheets pertain.
- C. Show valve dimensions including laying lengths. Show port sizes. Show dimensions and orientation of valve actuator, as installed on the valve. Show location of internal stops for gear actuators.
- D. Show valve linings and coatings.
- E. Submit manufacturer's catalog data and descriptive literature.

- F. Submit a report verifying that valve has passed shell and seat tests and that the valve interior linings have passed the test for holidays and lining thickness. Describe test results and repair procedures for the valve. Do not ship valve until the reports have been approved by the City.
- G. Submit the valve warranty certification per paragraph 3.5.

1.4 MANUFACTURERS

- A. The metal-seated triple offset butterfly valve must be Adams, Vanessa or approved equal.

1.5 QUALITY ASSURANCE

- A. Valve Testing: Shop-test each valve body under a test pressure equal to twice its design water-working pressure. The hydrostatic seat test shall be made free of any lubricant. There shall be no visible leakage under all seat tests including API 598. Perform torque tests on actuators to ensure compliance with this specification. The manufacturer shall test the valves. Vendor will be responsible for all above described costs for subsequent valve testing should the initial test fail.
- B. Certification: Prior to shipment, Vendor shall submit for valve and actuator, certified copies of all torque and hydrostatic factory tests, showing compliance with this specification and the applicable standards of AWWA, ANSI, ASTM, etc.
- C. The manufacturer shall be qualified in the manufacture of metal seated triple-offset butterfly valves of comparable size, capacity, and complexity as specified in this specification. The manufacturer's metal seated triple-offset butterfly valves of comparable size, capacity and complexity, as specified, shall have been successfully used in water service facilities for at least 5 years. The burden of proof as to the comparative quantity and suitability of equipment and material supplied shall be upon the manufacturer who shall furnish a list and contact information of water service facilities from the past 5 years that includes complete description, information, and performance data, showing the quality of the materials or equipment offered to those specified.

PART 2 - MATERIALS

2.1 GENERAL

- A. Supply valve complete with gear actuators, operating nuts, bypass line and valves and wrenches required for operation.
- B. Valve shall have the name of the manufacturer and size of the valve cast or molded onto the valve body or bonnet shown on a permanently attached plate.
- C. Direction of flow shall be cast or stamped on the valve body.

2.2 Butterfly Valve

- A. Butterfly valve shall be of high performance design and shall be rated for water working pressures of up to the maximum design pressure or 150 pounds force per square inch gauge

(psig), whichever is greater. The valve shall incorporate a triple-offset shaft design with an inclined conical seat and seal geometry which shall create a torque seating operation which shall provide bi-directional zero leakage shut-off and be designed in accordance with ASME B16.34 and B31.1 with the predetermined torque applied to the valve. Valve shall be of the metal seat design which shall be capable of bi-directional seating against pressures up to 150 psig applied to one side of the disc, with zero pressure applied to the other side of the disc in the CLOSED position, with zero leakage, and without damage or permanent deformation to any part of the valve body, seat, disc, shaft, bearings, or actuator.

1. Valve body shall be cast from carbon steel per ASTM A216 Grade WBC. Valve discs shall be cast from stainless steel per CF8M 316 Stainless Steel. Fabricated bodies and discs shall not be permitted. The valve seating edge shall be located within the valve body fully protected from the flow stream. Valve shafts shall be one-piece 17-4PH or 431 stainless steel construction and shall be designed in accordance with the requirements of API 609. The shaft diameter shall be reduced at the actuator connections so as to put the weakest point outside the valve above the packing. Allowable stresses shall be limited to 33-percent of Ultimate Tensile Strength and 67-percent of Yield Strength in accordance with ASME, Sec. III, Case N62.6. Disc attachment to the shaft shall be by means of Type 316 stainless steel, or Monel parallel keys. Pins of any kind shall not be used for torque transmission.
2. Valve seating surface for the seal ring shall be integral to the valve body or on the disc edge and shall be overlaid with stellite a minimum of 2.5 millimeters in the finished condition WITHOUT EXCEPTION. Valve without the stellite seating surface is not acceptable.
3. Valve shall have a field replaceable "laminated" seal ring retained in the body or on the disc. The seal ring shall be constructed of laminates of stainless steel and graphite. No elastomers shall be used in the sealing system. Seal ring design shall also include the following parameters:
 - a. The seal ring shall be accessible, e.g. replaceable, by positioning the disc in a proper orientation and removing an adjacent pipe spool piece without removing or disassembling the valve.
 - b. The seal ring shall be machined in an inclined conical shape to match the companion surface in the body or on the disc, as appropriate. The overall geometry of the seal ring shall be formed into an elliptical shape to provide resilient seating.
 - c. Each seal ring shall be identical and interchangeable for valves of the same size.
 - d. The seal ring shall be held securely in place by a stainless steel retaining ring bolted in place.
 - e. A spiral wound gasket shall be provided to prevent leakage around the seal ring. Flat static gaskets shall not be used.

- f. The seal ring shall be indexed and keyed to ensure exact and proper installation or reinstallation without shims.
 - g. No special tools shall be required to install the seal ring.
4. Packing shall be graphite and shall be provided by a minimum of four studs for precision adjustment and compression of the packing. A minimum of five packing rings shall be provided.
 5. Valve bearings shall be No-Resist or Type 316 stainless steel baked PTFE. Bearings shall be sealed from the ingress of particulates. Wetted bronze parts shall be in conformance with ASTM B62, containing not more than: 5-percent zinc, 2-percent aluminum, 8-percent lead, and 83-percent copper plus nickel, plus silicon.
 6. Valve body shall be double flanged, flat faced, which shall be able to withstand induced pipe loads without distortion and effect on the movement of the valve disc and seating operation. Flange thickness shall be designed in accordance with ASME Section VII flange design requirements and shall be suitable for mating to connecting pipe flanges conforming to AWWA Class D flange dimensions. Face to face dimensions of the valve shall conform to ISO 5752, Series 13 for Class 150.
 7. Operator mounting bracket will be centered with machined register and a minimum of two (2) dowel pins will be used in addition to bracket bolting the absorb torsional load from operator.
 8. Valve shaft shall rotate clockwise to close.
 9. Valve by pass shall be provided by the valve manufacturer and shall be intergral to the valve.

2.3 Valve Actuator

- A. Manual actuator shall be provided for the valve and shall be sized in accordance with AWWA C504 and C540, and meet the following requirements:
 1. Provide gear actuators designed for buried service which shall be of the worm and gear type. Worm gear actuators shall be Limitorque Model HBC, EIM Type WO, Auma GS 160.3 – GS 250.3 Series, or approved equal.
 2. Design gear actuators assuming the differential pressure across the disc is equal to the pressure rating of the valve or 150 psig, whichever is greater.
 3. Gear actuators shall be enclosed, lubricated with oil or grease, and provided with seals on shafts to prevent entry of dirt and water into the actuator. Gears shall be watertight, designed for buried service in groundwater. Actuators shall contain a dial indicating the position of the valve disc.
 4. Worm and gear actuators shall be of the totally enclosed design so proportioned as to

permit operation of the valve under full differential pressure rating, or a differential pressure of 150 psig, whichever is greater, with a maximum pull of 80 pounds and a maximum input of 150 feet-pounds on the operating nut. Provide stop limiting devices in the actuators in the OPEN and CLOSED positions. Actuators shall be of the self-locking type to prevent the disc from creeping. Design actuator components between the input and the stop-limiting devices to withstand without damage a pull of 200-pounds for handwheel and an input torque of 300-pounds for operating nuts when operating against the stops.

5. Self-locking worm gear shall be a one-piece design of gear bronze material (ASTM B427), accurately machine cut. The worm shall be hardened alloy steel (ASTM A322, Grade G41500; or ASTM A148, Grade 105-85), with thread ground and polished. Helix angle of worm gear shall be designed and cut at 3.5 degrees or less to prevent creep, unless other means to prevent creep are employed and are approved by the City. The actuator shall prevent creeping of the valve under all flow conditions. Provide reduction gearing to meet maximum torque and pull design requirements. The reduction gearings shall run in a proper lubricant.
6. Actuators shall open valve by turning counterclockwise.

2.4 RUBBER PARTS

- A. Rubber parts exposed to water shall be made of a rubber compound that is resistant to free chlorine and monochloramine concentrations up to 10 mg/l in the fluid conveyed.

2.5 MATERIALS

- A. Valve body shall be cast only and shall be equal to or better than ASTM A216 gr. WCB material with wall thickness to exceed 37.5 mm. Comply with applicable ASME B16.34 specifications.
- B. Valve disc shall be cast from stainless steel per CF8M 316 Stainless Steel as a minimum.
- C. Valve shaft material shall be high strength stainless steel, such as ASTM 182 gr. F6a material, and shall meet the requirements of ASTM A564 Type 630, H1150M (17-4 PH).
- D. Valve seal ring shall be laminate type of duplex stainless steel and graphite. Stainless steel meeting ASTM UNS S31803 SS (22-percent chrome ferritic-austenitic) may be used.
- E. Valve packing shall be a combination of graphite die-formed rings and braided graphite rope anti-extrusion rings.
- F. Packing gland and end-cap shall be stainless steel.
- G. Valve bottom flange bolting must be in compliance with ASME B31.1 and B31.3, and shall use at least four (4) retaining bolts. Material of bolting to be ISO 3506 A2 gr. 304 SS.

PART 3 - EXECUTION

3.1 PAINTING AND COATING

- A. Coat metal valves and accessories with 12 mil minimum fusion bonded epoxy or approved

equal. Apply the specified prime coat at the place of manufacture. Line the interior metal parts of metal valves 4-inches and larger, excluding seating areas and bronze and stainless steel pieces, with 12 mil minimum fusion bonded epoxy or approved equal. Lining and coating of valves shall be in accordance with AWWA C-550.

3.2 MOUNTING GEAR ACTUATORS

- A. The manufacturer shall select and mount the gear actuator and accessories on each valve and stroke the valve from fully open to fully closed prior to shipment.

3.3 VALVE TESTING

- A. Test the valve interior linings at the place of application with a low-voltage (22.5 to 80 volts, with approximately 80,000-ohm resistance) holiday detector, using a sponge saturated with a 0.5-percent sodium chloride solution. The lining shall be holiday free.
- B. Measure coating thickness with a calibrated magnetic-type or electronic dry-film thickness gauge. Provide dry-film thickness gauge as manufactured by Mikrotest or Elcometer. Check each for the correct dry-film thickness. Do not measure within eight hours after application of the coating.
- C. Pressure test the valve body and the valve seat according to the pressures and procedures described in this specification or in the AWWA Standard. Valve shall show zero leakage.
- D. Operate manual valve through 10 full cycles of opening and closing. Valve shall operate from full open to full close without sticking or binding. If valve sticks or binds, repair or replace the valve and repeat the tests.
- E. Actuators shall operate valve from full open to full close through 10 cycles without binding or sticking. The pull required to operate a hand wheel under full design pressure shall not exceed 80 pounds. The torque required to operate the valve having 2-inch AWWA nuts under full design pressure shall not exceed 150 foot-pounds. If actuators stick or bind or if pulling forces and torques exceed the values stated previously, repair or replace the actuators and repeat the tests. Fully lubricate actuators in accordance with the manufacturer's recommendations prior to operating.
- F. Actuator stops shall withstand a pull of 200 pounds for handwheel or chainwheel actuators, and an input torque of 300 foot pounds for 2-inch AWWA nuts, without damage to any component. Repair or replace any damaged component and repeat the test until the actuator passes the test without damage.

3.4 SHIPPING

- A. Package the equipment adequately to prevent damage during shipping. Before shipping flanged valve, clean flanges by wire brushing and coat unpainted machined surfaces of the flange with strippable, rust-preventative compound. Fasten full-face flange protectors of

waterproof plywood or weather-resistant pressboard, of a diameter at least that of the outside of the flange, to each flange to protect both the flange and the interior of the valve. Small valves may be fully packaged at the manufacturer's option. Bolt or otherwise fasten valves to skids or other supports so as to preclude damage in subsequent handling.

3.5 VALVE WARRANTY

- A. The manufacturer shall warrant the valve and valve actuator to be free from defects in materials, workmanship, and performance for five years from the date of acceptance of the valve by the City. Contractor shall provide the City a copy of the warranty per section 6-8.3, Warranty.

****END OF SECTION****

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section summarizes general requirements of electrical work specified in Division 16.

1.2 DESCRIPTION OF WORK

- A. The Contractor shall furnish labor, materials, equipment and services to store, transport, install, calibrate, and make operational electrical systems and equipment supplied under this contract. Include wiring, conduits, fittings, physical support systems, incidentals, and connections to link the individual components into an integrated system. Typical materials that may be incidentals are terminal lugs not furnished with vendor-supplied equipment, compression connectors for cables, splices, junction and terminal boxes.
- B. The Contractor shall install, wire, and connect all equipment and items furnished by CITY and under other divisions that require electrical connections unless otherwise indicated or specified. Include all field connections and terminations to all panels, control equipment and devices, instruments, and to all vendor-furnished packaged equipment.
- C. The Contractor shall include all concrete work required for encasement, installation, or construction of the Work specified in Division 16. Furnish 3000-psi concrete; the following shall apply:
 - 1. Consolidation of encasement concrete around duct banks shall be by hand puddling, and no mechanical vibration shall be permitted.
 - 2. A workability admixture shall be used in encasement concrete, which shall be a hydroxylated carboxylic acid type in liquid form. Admixtures containing calcium chloride shall not be used.
 - 3. Concrete for encasement of conduit or duct banks shall contain an integral red-oxide coloring pigment in the proportion of 8 pounds per cubic yard of concrete.
- D. The Contractor shall test all electrical connections and circuits for proper installation and operation.

1.3 PERMITS

- A. The Contractor shall procure and pay for permits and certificates required by local and state ordinances and fire underwriter's certificate of inspection.

1.4 SUBMITTALS

A. The Contractor shall include the following information in the submittals for this division:

1. Manufacturer, detailed items description, drawings, catalog literature and data edited to indicate specific items, such as conduit, fittings, supports, wire, cable, junction boxes, and pull boxes being provided.
2. All equipment shall be submitted in a common submittal. All installation details shall be submitted in a common submittal.
3. Installation detail drawings. Include typical details for raceway hangers and supports.
4. Complete material lists for the Work of this division. Such lists shall state the manufacturer and brand name of each item or class of material. Include shop drawings for all grounding work not specifically indicated.
5. Shop drawings are required for materials and equipment listed in other sections. Shop drawings shall provide sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications. The following shall be included:
 - a. Front, side, rear elevations and top views with dimensional data.
 - b. Location of conduit entrances and access plates.
 - c. Component data.
 - d. Connection diagrams, terminal numbers, wire numbers, internal wiring diagrams, conductor size, and cable numbers.
 - e. Method of anchoring, seismic requirement; weight.
 - f. Types of materials and finish.
 - g. Nameplates.
 - h. Temperature limitations, as applicable.
 - i. Voltage requirement, as applicable.
 - j. Front and rear access requirements.
6. Nameplate schedules.

- B. Maintenance manuals of sufficient detail to enable a qualified technician to perform maintenance and repair.
- C. Record Drawings: In addition to the record drawings as part of the record drawings requirements, the Contractor shall show depths and routing of all underground duct banks.

1.5 QUALITY ASSURANCE

- A. The drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment, and other items. The Contractor shall determine the exact locations in the field based on the physical size and arrangement of equipment, finished elevations, and other obstructions. Locations shown on the drawings, however, shall be adhered to as closely as possible.
- B. All conduit and equipment shall be installed in a manner to avoid all obstructions and to preserve headroom and keep openings and passageways clear. Where the drawings do not indicate exact locations, such locations shall be obtained from the Resident Engineer. Where equipment is installed without instruction and must be moved, it shall be moved without additional cost to the City.
- C. All materials and equipment shall be installed in accordance with printed recommendations of the manufacturer, which have been reviewed by the Resident Engineer. Workmen skilled in this type of work shall accomplish the installation and installation shall be coordinated in the field with other trades so that interference's are avoided.
- D. All Work, including installation, connection, calibration, testing, adjustment, and paint touchup, shall be accomplished by qualified personnel working under continuous, competent supervision. The completed installation shall display competent work, reflecting adherence to prevailing industrial standards and methods.
- E. The Contractor shall furnish adequate means for and shall fully protect all finished parts of the materials and equipment against damage from any cause during the progress of the Work and until acceptable by the Resident Engineer.
- F. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. All moving parts shall be kept clean and dry.
- G. The Contractor shall replace or have refinished by the manufacturer, all damaged materials or equipment, including faceplates of panels and switchboard sections, at no cost to the City.
- H. The Contractor shall perform all tests required by the Resident Engineer or other authorities having jurisdictions. All such tests shall be performed in the presence of the Resident

Engineer. The Contractor shall furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor necessary due to damage resulting from damaged equipment or from test and correction of faulty installation. The following testing shall be accomplished:

1. Testing for the ground resistance value specified in Section 16450 – Grounding.
 2. Insulation resistance tests specified in Section 16120 – Wires And Cables.
 3. Operational testing of all equipment furnished and/or connected in other sections of Division 16, including furnishing of support labor for testing.
- I. Any test failure shall be corrected in accordance with the industry practices and in a manner satisfactory to the Resident Engineer.
- J. The Contractor shall perform all work in accordance with all applicable provisions of the following:
1. All applicable requirements of the rules and regulations of the local bodies having jurisdiction. In addition, the Work of this division shall comply with the requirements of the current edition of the Standard Specifications for Public Works Construction (SSPWC) Section 209-1 Iron Pipe And Fittings , together with the latest adopted editions of the Regional and City of San Diego Supplement Amendments.
 2. NFPA-70 “The National Electrical Code”, latest edition.
 3. ANSI C-2 “The National Electrical Safety Code”, latest edition.
 4. NECA “National Electrical Contractors Association” guidelines.
 5. All applicable requirements of the Federal Communication Commission and the Federal Aviation Authority.
 6. Government Standards:

FS W-C-596E/GEN(1) Outlet, Electrical Power	Connector, Plug, Receptacle and Cable
FS W-S-896E/GEN(1)	Switches, Toggle (Toggle and Lode), Flush Mounted (ac)
FS WW-C-581D, E	Conduit, Metal, Rigid, And Intermediate; And Coupling, Elbow, and Nipple, Electrical Conduit: Steel, Zinc Coated
- Commercial Standards:

ANSI C80.1 Specification for	Zinc Coated, Rigid Steel Conduit,
ANSI C80.4 Tubing, Specifications for	Fittings for Rigid Metal Conduit and Electrical Metallic
ANSI/UL 467 Standard for	Grounding and Bonding Equipment, Safety
ASTM B3	Soft or Annealed Copper Wire
ASTM B8	Specification for Concentric-Lay-Stranded Copper
	Conductors, Hard, Medium-Hard, and Soft
ASTM B33	Specification for Tinned Soft or Annealed Cooper
Wire for Electrical Purposes	
ASTM D1784	cell classification PVC 1223-A, B, or C
ICEA S-61-402	Thermoplastic - Insulated Wire and Cable
ICEA S-66-524, NEMA WC7	Cross-Linked, Thermosetting, Polyethylene
Wire and Cable	
ICEA S-68-516, NEMA WC8	Ethylene Propylene Rubber Insulated Wire
	and Cable
NEMA 250 maximum	Enclosures for Electrical Equipment (1,000 volts
UL 6	Rigid Metal Electrical Conduit
UL 44	Rubber - Insulated Wire and Cable
UL 514	Electrical Outlet Boxes and Fittings

K. Construction and installation of all electrical equipment and materials shall comply with all applicable provisions of the OSHA Safety and Health Standards (29CFR1910 and 29CFR 1926, as applicable), State Building Standards, and applicable local codes and regulations.

L. Unless otherwise specified, the Contractor shall use new materials of current production which conform to standards established by Underwriter's Laboratories, Inc., and are so marked or labeled, together with manufacturer's brand or trademark. Equipment and material which are not covered by UL standards will be accepted provided such material is listed, labeled, certified, or otherwise determine to meet safety requirements of an independent nationally recognized testing laboratory acceptable to the local code-enforcement agency having jurisdiction. Equipment of a class which no independent

nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards such as NEMA or ANSI. Submit certified test reports and shop drawings as evidence of compliance.

- M. The Contractor shall use one manufacturer for like items and associated equipment. Components of an assembled unit need not be products of the same manufacturer.
- N. The Contractor shall not interfere with continuous operation of the CITY's equipment, unless otherwise approved by the CITY.
- O. The Contractor shall inspect the intended storage space at the site. Provide conditioning as required to protect the equipment. Provide a written report on the adequacy of storage.
- P. The Contractor shall protect all stored and installed materials and equipment from physical damage, adverse weather conditions, moisture, and corrosion until final acceptance. Replace or repair any damaged equipment to the satisfaction of the Engineer.

1.6 CLEANUP

- A. Cleaning of Materials and Equipment: All parts of the materials and equipment shall be thoroughly cleaned. Exposed parts shall be thoroughly clean of cement, plaster, and other materials. All oil and grease spots shall be removed with a nonflammable cleaning solvent. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Paint touchup shall be applied to all scratches on panels and cabinets. Electrical cabinets or enclosures shall be vacuum cleaned before final acceptance.
- B. Cleaning of the Site: During the progress of the Work, the Contractor shall clean the premises and leave the premises and all portions of the site free of debris.

1.7 DEMOLITION AND RELATED SITES WORK

- A. Installation of New Equipment in Existing Structures:
 - 1. Installation of certain new equipment and devices is required in existing structures. For this phase of the Work, the Contractor shall remove existing equipment or devices, install new equipment as indicated, remove existing conductors from existing raceways, and pull new conductors in existing raceways, reconnect existing conductors or furnish and install new conduit and wires.
 - 2. The Contractor shall visit the sites before bidding and carefully examine existing installations so that its proposal will reflect all the Work necessary to provide a complete installation so that the resulting installation will function as required. Include in the bid price all costs of labor and materials necessary to complete installations.

B. Installation of Temporary Equipment:

1. To facilitate continuous operation of existing equipment, temporary equipment shall be provided where indicated. The Contractor shall submit installation and connection details for review and acceptance. Temporary installations shall be provided at no additional cost to the City.
2. All cables, conduits, and fittings used in temporary connections shall not be reused to install permanent connections. Salvaged items shall be returned to the City.

C. Plant Monitoring Power and Control Shutdowns:

1. Existing operations shall be continued during this demolition process. The Contractor shall carefully examine all Work to be done in, on, or adjacent to existing equipment. Work shall be scheduled, subject to the City's approval, to minimize required shutdown time of sites. The Contractor shall submit a written request, including sequence and duration of activities to be performed during shutdown.
2. The Contractor shall perform all switching and safety tagging required for shutdowns or to isolate existing equipment. In no case shall the Contractor begin any Work in, on, or adjacent to existing equipment without written authorization of the Resident Engineer.

D. Modifications to Existing Electrical Facilities:

1. The Contractor shall provide all modifications or alterations to existing electrical facilities required to successfully install and integrate the new electrical equipment. All modifications to existing equipment, panels, or cabinets shall be made in a professional manner with all coatings repaired to match existing. Modifications to existing electrical facilities required for a complete and operating system shall be made at no additional cost to the City. Extreme caution shall be exercised in digging trenches in order not to damage existing underground utilities. Cost of repairs of damages caused during construction shall be the Contractor's responsibility.
2. The Contractor shall verify all available existing circuit breakers in lighting panels for their intended use as required by the drawings. At no additional cost to the City, the Contractor shall verify the available space in substation switchboards to integrate new power circuit breakers.

PART 2 – PRODUCTS (Not Used)

PART 3 -- EXECUTION

3.1 EXAMINATION

- A. The Contractor shall verify equipment locations and delivery routes prior to installation to ensure the equipment will fit in the available space. The drawings do not indicate exact scale or dimension.
- B. Existing raceways that contain space to run wiring may be used where indicated on the drawings. Do not damage existing equipment or wiring. Do not interrupt control or monitoring signals or power. The Contractor shall obtain prior approval from the Resident Engineer before pulling wires.

3.2 INSTALLATION

- A. The Contractor shall provide temporary installations adjacent to existing equipment where noted.
- B. After modifying existing equipment, the Contractor shall dismantle temporary installations and restore to original condition.
- C. Perform work neatly. The Contractor shall keep sites clean of accumulation of cartons, trash and debris. Remove trash and debris daily. Vacuum clean cabinets, panels and enclosures installed or modified.
- D. The Contractor shall route and locate equipment items so as not to obstruct access to equipment, personnel walkways, or expose it to potential mechanical damage.
- E. Install items straight and plumb. The Contractor shall exercise care so that like items are mounted the same position, heights and general location. Securely anchor and fasten items.
- F. The Contractor shall locate and install electrical devices to afford maximum safety to personnel making adjustments, manual operations, or replacement of these devices. Locate items to permit them being reached without the use of ladders or without climbing or crawling over or under obstacles such as motors, pumps, piping, and ductwork.
- G. The Contractor shall use bushings for entrances to existing panels, cabinets, or enclosures through drilling and knock-outs.
- H. The Contractor shall tag wires with foreign voltages to indicate source of power.

3.3 GENERAL

- A. The Contractor shall install electrical equipment and material of the size, type, and general routing as shown on the drawings.
- B. The Contractor shall install metallic raceway, fittings, boxes, and cabinets free from direct contact with reinforcing steel.
- C. The Contractor shall provide fasteners, anchor bolts, anchorage items and supports as required for rigid alignment and sized according to size and weight of equipment and thickness of supporting surfaces.
- D. Where aluminum is placed in contact with dissimilar metal or concrete, the Contractor shall separate contact surfaces with gasket, non-absorptive tape, or coating to prevent corrosion.
- E. The Contractor shall make metallic conduit, raceways, and cable trays electrically and mechanically continuous and ground as required. Conduits shall be continuous between outlets, boxes, cabinets, and panels, and shall enter and be secured to each box.
- F. A ground conductor shall be provided in each raceway run.
- G. Not more than one 3-phase circuit or feeder shall be installed in a conduit run.

3.4 TESTING

- A. The Contractor shall perform field-testing to demonstrate correct installation and operation of equipment.
- B. Upon completion of work, the Contractor shall test the electrical system for shorts and grounds and proper phasing. The Engineer will observe the testing.

3.5 CLEANING

- A. Touch up paint surfaces marred during installation. The Contractor shall submit color samples prior to painting. Remove foreign paint from exterior and touch up scratches with same paint as original. Sand, prime, and repaint rusted areas.
- B. Clean and lubricate relay contacts, pushbutton and other control devices installed or modified. Lubricate with CRC 2-26 or other lubricant or cleaning agent specifically designed for this purpose.
- C. At completion of work in any area, the Contractor shall remove all debris and unused materials and equipment and leave all areas broom clean. Where work in carpeted areas

results in visible soiling of carpets, clean the affected carpets and restore them to the original condition.

3.6 PROTECTION

- A. The Contractor shall maintain site security.
 - 1. Verify that all cabinets, doors, and gates that were opened during the day are locked when leaving.
 - 2. Do not leave unlocked cabinets unattended.

3.7 PAYMENT

- A. Payment for all Electrical/Solar/Instrumentation/Controls/SCADA components will be paid for at the lump sum price under the bid item "Electrical Work".

****END OF SECTION****

SECTION 16110

RACEWAYS

PART 1 -- GENERAL

1.1 SUMMARY

A. The section describes the requirements for raceways including the following:

1. Conduit
2. Fittings
3. Miscellaneous Specialty Fittings
4. Raceway Supports
5. Underground Ducts and Manholes
6. Outlet, Junction, and Pull Boxes
7. Wiring Devices
8. Terminal Cabinets
9. Sealants

B. Reference is made to the following related sections:

1. Conduit identification per Section 16195 - Electrical Identification.
2. Conduit support per Section 16190 - Supporting Devices

1.2 SUBMITTALS

A. See Section 16010 Raceway for general submittal requirements for Division 16.

1.3 SYSTEM DESCRIPTION

- A. Size conduit in accordance with the National Electrical Code, but galvanized rigid steel (GRS) conduit shall be no smaller than 3/4 inch and schedule 40 PVC conduit shall be no smaller than 1 inch. Use larger sizes if shown.
- B. Use fittings of the same material and match the raceway.

- C. PVC coated galvanized rigid steel conduit (GRS) shall be used in all exposed and/or above grade locations and within underground vault structures and for all signal wiring. Schedule 40 PVC shall be used for direct buried or concrete encased underground locations for power and control wiring, concrete encased. 24 Vdc discrete and analog signals may occupy the same conduit.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. General: Raceway shall be manufactured in accordance with UL and ANSI standards and shall bear UL label as applicable.
- B. Galvanized Rigid Steel (GRS) Conduit:
 - 1. Rigid steel conduits and fittings shall be full weight, mild steel, hot-dip galvanized and zinc bichromate coated inside and outside after galvanizing.
 - 2. Each piece of conduit shall be straight, free from blisters and other defects, cut square and taper reamed. Furnish in 10 foot lengths minimum, threaded at each end. Provide couplings at one end and a protective sleeve for the other end.
 - 3. Rigid steel conduit shall be manufactured in accordance with UL Standard No. 6 and ANSI C80.1.
 - 4. Rigid steel conduit shall be manufactured by Triangle PWC, Republic Steel, or equal.
- C. Rigid Nonmetallic Conduit: Rigid nonmetallic conduit shall be Schedule 40 PVC.
 - 1. Nonmetallic conduits and fittings shall be UL listed, sunlight-resistant, and rated for use with 90 degrees C conductors.
 - 2. Use expansion joints as recommended by the manufacturer.
 - 3. Nonmetallic conduits and fittings shall be manufactured by Carlon, Condux, or equal.
- D. Flexible Metallic Conduit: Liquid-tight flexible metallic conduit shall have an extruded PVC covering over the flexible steel conduit. Conduit shall be approved for grounding. For conduit sizes 3/4 inch through 1-1/4 inches, flexible conduits shall have continuous built-in copper ground conductor. Flexible conduit shall be American Brass, Anaconda, Electroflex, or approved equal. Explosion-proof flexible conduits shall be used for Class I, Div. 1, Group C&D areas.
- E. PVC coated GRS shall be 40 mil coating. Robroy, OCAL, or approved equal.

2.2 FITTINGS

- A. General: Fittings shall comply with the same requirements as the conduit with which they will be used. Fittings having a volume less than 100 cubic inches for use with rigid steel conduit, shall be cast or malleable nonferrous metal. Such fittings larger than one inch shall be "mogul size." Fittings shall be of the gland ring compression type. Use threaded connectors for all rigid metal conduits. Covers of fittings, unless in "dry" locations, shall be closed with gaskets. Surface-mounted cast fittings, housing wiring devices in outdoor and damp locations, shall have mounting lugs.
- B. Insulated Bushings: Insulated bushings shall be molded plastic or malleable iron with insulating ring, similar to O-Z Type A and B, equivalent types by Thomas & Betts, Steel City, Appleton, O-Z/Gedney, or approved equal.
- C. Insulated Grounding Bushings: Insulated grounding bushings shall be malleable iron with insulating ring and with ground
- D. Erickson Couplings: Erickson couplings shall be used at all points of union between ends of rigid steel conduits which cannot be coupled. Running threads and threadless couplings shall not be used. Couplings shall be 3-piece type such as Appleton Type EC, equivalent types such as manufactured by T & B, Steel City, O-Z/Gedney, or approved equal.
- E. Liquid-Tight Fittings: Liquid-tight fittings shall be similar to Appleton Type ST, equivalent types such as manufactured by Crouse-Hinds, T & B, O-Z/Gedney, or approved equal.
- F. Hubs: Hubs for threaded attachment of steel conduit to sheet metal enclosures, where required, shall be similar to Appleton Type HUB, equivalent types such as manufactured by T & B, Myers Scrutite, or approved equal.
- G. Transition Fittings: Transition fittings to mate steel to PVC conduit, and PVC access fitting, shall be as furnished or recommended by the manufacturer of the PVC conduit.
- H. Sealed Fittings: Sealing fittings are required in conduit runs entering corrosive areas and elsewhere as shown. Sealing fittings shall be Appleton Type EYS, O-Z Type FSK, or approved equal. Sealing compound shall not be poured in place until electrical installation has been otherwise accepted.
- I. Expansion Fittings: Expansion fittings shall be installed wherever a raceway crosses a structural expansion joint. Such fittings shall be expansion and deflection type and shall accommodate lateral and transverse movement. Fittings shall be O-Z/Gedney Type "DX," Crouse Hinds "XD," or approved equal. These fittings are required in metallic and nonmetallic raceway installations. When the installation is in a nonmetallic run, a 3-foot length of rigid conduit shall be used to connect the nonmetallic conduit to the fitting.

2.3 MISCELLANEOUS SPECIALTY FITTINGS

- A. Provide conduit thru-wall seals where conduits pass through exterior concrete or masonry walls below grade. The seals shall consist of a hot dip galvanized steel sealing gland assembly capable of providing a seal around the conduit to withstand 50 feet of water head without leakage. The shell of the seal shall have at least two cast collars at a right angle to the sleeve that is embedded in the concrete. For new structures, provide O-Z/Gedney type WSK, or approved equal. For cored hole applications in existing structures, provide O-Z/Gedney type CSM, or approved equal.

2.4 RACEWAY SUPPORTS

See Section 16190 Supporting Devices for raceway support.

2.5 UNDERGROUND DUCTS AND MANHOLES

- A. General: Where an underground distribution system is required, it shall be comprised of multiple runs of single bore nonmetallic ducts, concrete encased, with steel reinforcing bars, with underground manholes and pullboxes. They shall be rigid Schedule 40 PVC for concrete encasement.

- 1. Manholes and pullboxes shall be of precast concrete. Concrete construction shall be designed for traffic loading.

Covers shall be traffic type, except as shown otherwise. Manholes and pullbox covers designated as "HV" covers shall be identified as "High Voltage Electric," "P" shall be identified as "Secondary Electric," "C" as "Control" and "S" as "Signal." All covers shall be watertight after installation.

Manholes and pullboxes shall be equipped with pulling-in irons opposite and below each ductway entrance.

Manholes shall have concrete covers with 30-inch diameter lids. All covers and lids shall be bolted to cast-in-place frames with corrosion resistant hardware. Frames shall be factory-primed; covers shall be cast-iron and shall have pick holes.

- 2. Manholes and pullboxes shall have cable supports so that each cable is supported at 3-foot intervals within the manhole or pullbox. Cable supports and racks shall be fastened with galvanized bolts and shall be fabricated of fiberglass or galvanized steel. Porcelain insulators for cable racks shall be provided.
- 3. Manholes and pullboxes shall be Brooks, Quikset, U.S. Precast, or approved equal. Cast-iron covers shall be by U.S. Foundry, or approved equal.

2.6 OUTLET, JUNCTION, AND PULL BOXES

- A. General: Outlet, switch, pull and junction boxes for flush-mounting in general purpose locations shall be one-piece, galvanized, pressed steel. Ceiling boxes for flush-mounting in concrete shall be galvanized, pressed steel.
- B. Corrosive Locations: The entire project site shall be considered a corrosive location. Control station, pull and junction boxes, including covers, for installation in corrosive locations shall meet the NEMA 4X requirements and shall be stainless steel and shall be furnished with mounting lugs.

2.7 TERMINAL CABINETS

- A. Provide terminal cabinets as suitable for flush or surface mounting, dry or wet locations, as indicated on the Drawings. Cabinets shall meet the following additional requirements:
 - 1. Continuous piano hinged door(s) and back panel to mount terminal blocks.

Cabinet boxes shall be constructed of 316 Stainless Steel.
 - 3. Cabinet trims constructed of sheet steel in accordance with UL standards. Trims for surface mounted panels shall be provided with factory applied prime and finish coats of paint. Trims for flush mounted cabinets shall be provided with factory applied prime coat of paint suitable for field application of finish paint, except as otherwise noted.
 - 4. Non-metallic or aluminum backboards.
 - 5. 18 inches in width, 24 inches in height, and 4 inches in depth unless shown otherwise on the Drawings.
 - 6. Provide a minimum of 12 terminals in each cabinet. Provide 25% spare terminals. Terminals shall be Marathon No. 1600, Buchanan No. 218, or approved equal.

2.8 SEALANTS

- A. Provide non-hardening, UL approved type for wall penetrations and underground ductbank seals.
- B. Provide hard setting, UL approved type for hazardous location seal fittings.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Raceways shall be installed as indicated, however, conduit routings shown are diagrammatic. The Contractor shall check location of equipment connections before installing raceways and locate and arrange raceways accordingly. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be accomplished with tools designed for the purpose intended. Factory elbows shall be used for all 3/4-inch conduit. Bends in larger sizes of metallic conduit shall be accomplished by field bending or by the use of factory elbows. All installations shall be in accordance with the latest edition of the NEC.
- B. Raceways shall be installed in accordance with the following schedule:
1. Low Voltage Raceway (control, power, data and communications):
 - a. Rigid Schedule 40 PVC shall be used for concrete encased duct in earth.
 - b. PVC coated GRS conduit and fittings shall be used in vaults and all exposed, above ground locations.
 2. Analog Signal Raceways:
 - a. Galvanized rigid steel conduits shall be used for concrete encased duct on earth.
 - b. PVC coated galvanized rigid steel conduits shall be used on exposed installations in general purpose areas.
 - c. PVC coated galvanized rigid steel shall be used on exposed installations in outdoor areas.
- C. Exposed Raceways:
1. Conduits shall be rigidly supported with clamps, hangers, and Unistrut channels or approved equal.
 2. Intervals between supports shall be in accordance with the National Electric Code.
- D. Conduit Terminations: Empty conduit terminations not in manholes or pullboxes shall be plugged. Exposed raceway shall be installed perpendicular or parallel to buildings except where otherwise indicated. Conduit shall be terminated with flush couplings at exposed concrete surfaces. Conduit stubbed up for floor-standing equipment shall be placed in accordance with approved shop drawings. Metallic raceways installed below-grade or in outdoor locations and in concrete shall be made up with a conductive waterproof compound

applied to threaded joints. Compound shall be Zinc Clads Primer Coatings No. B69A45, HTL-4 by Crouse-Hinds, Kopr Shield by Thomas & Betts, or approved equal.

- E. Install metallic raceway, fittings, boxes, and cabinets free from direct contact with reinforcing steel.
- F. Provide fasteners, anchor bolts, anchorage items and supports as required for rigid alignment and sized according to size and weight of equipment and thickness of supporting surfaces.
- G. Make metallic conduit, raceways, and cable trays electrically and mechanically continuous and ground as required. Conduits shall be continuous between outlets, boxes, cabinets, and panels, and shall enter and be secured to each box.
- H. Provide ground conductor in each raceway run.

3.2 CONDUIT INSTALLATION

- A. Conduit may be cast integral with horizontal and vertical concrete slabs, providing one- inch clearance is maintained between conduit surface and concrete surface. If said clearance cannot be maintained, the conduit shall be installed exposed below elevated slabs; provided, that in the case of slabs on grade, conduit shall be installed below the slab. Maximum size of conduit that can be cast in slab shall be 1-1/2 inches.
- B. Nonmetallic conduit may be cast integral with horizontal slabs with placement criteria stated above. Non-metallic conduit may be run beneath structures or slabs on grade, without concrete encasement. In these instances conduit shall be placed at least 12 inches below the bottom of the structure or slab. Nonmetallic conduit may be buried 24 inches minimum below grade, with a 3-inch concrete cover, in open areas or where otherwise not protected by concrete slab or structures. Top of concrete cover shall be colored red. Nonmetallic conduit shall be permitted only as required by the Specifications and in concealed locations as described above.
- C. Where a run of concealed PVC conduit becomes exposed, a transition to rigid steel conduit is required. Such transition shall be accomplished by means of a factory elbow or a minimum 3-foot length of PVC coated rigid steel conduit, either terminating at the exposed concrete surface with a flush coupling. Piercing of concrete walls by nonmetallic runs shall be accomplished by means of a short steel nipple terminating with flush couplings.
- D. Flexible conduit shall be used at dry locations for the connection of equipment such as motors, transformers, instruments, valves, or pressure switches subject to vibration or movement during normal operation or servicing. Flexible conduit may be used in lengths required for the connection of recessed lighting fixtures; otherwise the maximum length of flexible conduit shall be 18 inches.
- E. In other than dry locations, connections shall be made using flexible liquid-tight conduit.

Equipment subject to vibration or movement which is normally provided with wiring leads, such as solenoid valves, shall be installed with a cast junction box for the make-up of connections. Flexible conduits shall be as manufactured by American Brass, Cablec, Electroflex, or approved equal.

- F. Galvanized Rigid Steel Conduit (GRS): Treat field cut threads with a liquid galvanized solution or a conductive rust inhibitor that will maintain ground continuity before installing locknuts, bushings, or other fittings. Where required use UL approve conduit unions. Do not use split couplings or running threads in lieu of unions.
- G. Flexible Metallic Conduit (liquid tight): Use only for terminations to vibrating or moving equipment such as motors or transformers. Connectors shall be liquid tight, stainless steel, or bronze with insulated throats.
- H. Rigid nonmetallic conduit: All exposed bends shall use rigid steel conduit. All risers shall use rigid steel conduit. Do not use PVC conduit for routing of analog or communication signal circuits.
- I. Earth Buried Conduits
 - 1. For conduits buried in earth provide minimum 30 inches of cover and minimum of one foot clearance between other utility crossings and parallel runs. Maintain a grade of at least four inches per 100 feet either from one manhole or pull box to the next or from a high point between them. Drain conduits away from building, if not possible provide watertight seal at building.
 - 2. Provide detectable warning tape per SDM-105.
- J. Conduit Damage Correction Repair cuts, nicks, and abrasions or replace damaged conduit as directed.
- K. Conduit Penetrations
 - 1. Seal all raceways entering structures at the first box or outlet with oakum or suitable plastic expandable compound to prevent the entrance into the structure of gases, liquids, or rodents.
 - 2. Dry pack with nonshrink grout around raceways that penetrate concrete walls, floors, or ceilings aboveground, or use one of the methods indicated for underground penetrations.
 - 3. Where an underground conduit enters a structure through a concrete roof or a membrane waterproofed wall or floor, provide an acceptable, malleable iron, watertight, entrance sealing device. When there is no raceway concrete encasement, provide such device having a gland type sealing assembly at each end with pressure bushings that may be tightened at any time. When there is raceway concrete

encasement indicated, provide such a device with a gland type sealing assembly on the accessible side. Securely anchor all such devices into the masonry construction with one or more integral flanges. Secure membrane waterproofing to such devices in a permanently watertight manner.

4. Make concealed penetrations for conduits not more than 1/4 inch larger than the diameter of the conduit. Make penetrations through walls, ceiling, and floors other than concrete for exposed conduits not more than 1/4 inch larger than the diameter of the conduit. Fill void around conduit with caulking compound and finish surface same as wall, ceiling, or floor.
5. Where a conduit enters through a concrete non-waterproofed wall, floor, or ceiling, provide a galvanized steel sleeve, Schedule 80, and fill the space between the conduit and sleeve with plastic expandable compound or an oakum and lead joint. If the sleeve is not placed with the concrete, drill hole not less than 1/2-inch or more than one inch larger than sleeve, center sleeve, and grout sleeve total depth of penetrated concrete with non-shrink grout, polyurethane, or silicone sealant.
6. Where conduits penetrate walls, install junction box on other side of penetration. Separate 120 Vac boxes from low, dc voltage circuits.

3.3 UNDERGROUND DUCTS AND MANHOLES INSTALLATION

- A. Duct Bank Installation: The underground concrete encased duct bank shall be installed in accordance with the criteria below:
 1. Duct shall be assembled using high impact nonmetallic spacers and saddles to provide conduits with vertical and horizontal separation. Plastic spacers shall be set every 5 feet.
 2. The duct shall be laid on a grade line of at least 4 inches per 100 feet, sloping towards pullboxes or manholes. Duct shall be installed and pullbox and manhole depths adjusted so that the top of the concrete envelope is a minimum of 24 inches below grade.
 3. Changes in direction of the duct envelope by more than 10 degrees horizontally or vertically shall be accomplished using bends with a minimum radius 24 times the duct diameter.
 4. Couplings shall be staggered at least 6 inches vertically. Bottom of trench shall be of select backfill or sand. The duct array shall be anchored every 4 feet to prevent movement during placement of the concrete envelope.
 5. Each bore of the completed duct bank shall be cleaned by drawing through it a standard flexible mandrel one foot long and 1/4-inch smaller than the nominal size of the duct through which the mandrel will be drawn. After passing of the

mandrel, draw a wire brush and swab through.

6. A raceway, in the duct envelope, which does not require conductors, shall have a 1/8-inch polypropylene pull cord installed throughout the entire length of the raceway.
- B. Duct Entrances: Duct entrances shall be grouted smooth; duct for primary and secondary cables shall be terminated with flush end bells. Sections of pre-fabricated manholes and pullboxes shall be assembled with waterproof mastic and shall be set on a bed of gravel as recommended by the manufacturer or as required by field conditions.
- C. Duct Bank Markers: Duct bank markers shall be installed every 200 feet along run of duct bank, at changes in horizontal direction of duct bank, and at ends of duct bank. Concrete markers, 6 by 6 inches square and one foot long, shall be set 2 inches above finish grade. The letter "D" and arrow set in the concrete shall be facing in the direction of the duct alignment.
- D. Watertight Penetrations: Duct bank penetration through walls of manholes or pullboxes, and on building walls below grade shall be watertight.
- E. Trench Backfill: Trenches containing duct banks shall be filled with select backfill with no large rocks which could damage the duct.
- F. Concrete Encased Duct Banks: Concrete encased duct bank shall terminate at building foundations. When duct enters the building on a concrete slab on grade, duct shall not be encased, but shall transition to rigid steel PVC-coated conduits on all stub-ups.

3.4 TERMINAL CABINETS INSTALLATION

- A. Provide terminal cabinets where shown on the Drawings and in accessible locations with working space in front of and around the installation.
- B. Cabinets shall be set plumb at an elevation that will cause the maximum circuit breaker height to be less than 66 inches above grade. Top edge of trim of adjacent panels shall be at the same height. Panels which are indicated as flush mounted shall be set so cabinet is flushed and serves as a "ground" for plaster application.
- C. All factory wire connections shall be made at shipping splits, and all field wiring and grounding connections shall be made after the assemblies are anchored.
- D. Identify each circuit and conductor.
- E. Provide terminals and connectors to match the cable being terminated.

3.5 OUTLET, JUNCTION, AND PULL BOXES INSTALLATION

- A. For boxes mounted on steel, concrete, and masonry surfaces provide minimum ¼- inch spacer to hold box away from surface.
- B. Sizing: Pull and junction boxes shall be sized in accordance with the requirements of the NEC.
- C. Outlet Boxes: Outlet boxes shall be used as junction boxes wherever possible. Where separate pullboxes are required, they shall have screw covers.
- D. Requirements: Pullboxes shall be installed when conduit run contains more than three 90-degree bends and runs exceed 200 feet.
- E. Opening in terminal panels, outlet and junction boxes shall be by means of welded bosses, standard knockouts, or shall be sawed, drilled, or punched with tools specially made for the purpose. The use of a cutting torch is prohibited. Unused openings shall be plugged per the NEC.
- F. Remove debris including dust, dirt, wire clippings and insulation from interior of boxes. Replace damaged boxes or boxes with open circuit holes.
- G. Where boxes are shown on each side of a common wall do not mount back-to-back but offset horizontally minimum of six inches.
- H. For wet or damp indoor or outdoor locations use boxes of rust and corrosion resistant NEMA 4X, with at least 5 1/2 full threads for each (bossed) conduit opening. Boxes to be suitable for flush or surface mounting as required with drilled external, cast mounting extensions (bossed to provide at least 1/8" between back of box and mounting surface for drainage). Box covers shall be hinged or cap screw retained as required, of the same material as the box and provided with stainless steel (rust proof) hardware. Indoor location may use boxes constructed of stainless steel or non-metallic. Outdoor boxes shall be stainless steel.
- I. For underground locations use boxes constructed of reinforced concrete cast-in-place or pre-fabricated as shown on the Drawings.

****END OF SECTION****

SECTION 16120

WIRES AND CABLES

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section describes requirements for power, control, and instrumentation wiring including the following:
 - 1. 600 volt and below power cable.
 - 2. 600 volt and below control cable.
 - 3. Shielded signal instrument cable.
 - 4. Wire terminations, splices, and Connectors.
- B. Reference is made to the following related sections:
 - 1. Conductor identification per Section 16195 - Electrical Identification.
 - 2. Installation in raceways per Section 16110 - Raceways.

1.2 SUBMITTAL

- A. In addition to the general submittal requirement in section 16010 Raceways, include the following in the submittal for this section:
 - 1. Twelve-inch length of wire and cable with tag from coils or reel from which samples are taken. The sample shall show manufacturer, coil or reel number from which sample was taken, insulation type and ratings, conductor AWG, and voltage class of cable.
 - 2. Cable test procedures and methods.
 - 3. Cable test results and certification.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wire and cable in unbroken package or reels that bear the manufacturer name, the dates of manufacture, wire size, and wire type.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. All conductors, including ground conductors, shall be copper. Insulation shall bear UL label and the manufacturer's trademark, type, voltage, and temperature rating, and conductor size. Wire and cable shall be the products of American, Rome Cable, Okonite, Houston Wire and Cable, or approved equal.
- B. Provide lightning and transient surge protection on each end of the radio coax cable.

2.2 MATERIALS

- A. **Single Conductor Power Cable.** Single conductor power cable shall be 12 AWG minimum. Conductors shall be copper, stranded, 600-volt, THHN/THWN insulation, and shall be UL listed.
- B. **Single conductor Control Cable.** Single conductor control cable shall be 14 AWG minimum. Conductors shall be copper, stranded, with 600-volt, THHN/THWN insulation, and shall be UL listed.
- C. **Multiconductor Control Cable.** Multiconductor control cable shall be 14 AWG with copper conductors 600 volt, THHN/THWN insulation, and overall PVC jacket applied over tape wrapped cable core. Cable shall be rated type TC and shall be UL listed. Cable shall be rated 90 C dry, 75 C wet. Conductors shall be identified per ICEA S-61-402 Appendix K, Method 1 or Method 3. White or green conductors shall not be provided.
- D. **Single Shielded Pair or Triad.** Conductors shall be 16 AWG minimum. Cable shall have 300 volt insulation. Wires shall have uniform twists with a minimum of 6 twists per foot. Each pair or triad shall be provided with a continuous foil or metalized plastic shield providing 100 percent coverage. Each pair or triad shall contain a tinned copper drain wire in continuous contact with the shield. Each pair shall have a black and white wire, each triad shall have a black, white, and red wire. Insulated conductors shall meet the requirements of UL 62 for type TFN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the vertical flame test requirements of UL 1277 and shall be rated type TC and shall be UL listed.
- E. **Multiconductor shielded pair or triad.** Conductors shall be 18 AWG minimum. Wires shall have uniform twists with a minimum of 6 twists per foot. Each pair or triad and cable assembly shall be provided with a continuous foil or metalized plastic shield providing 100 percent coverage and total shield isolation from all other pair or triad shields. Each pair shall have a black and white wire, each triad shall have a black, white, and red wire. Each pair or triad shall contain a tinned copper drain wire in continuous contact with the shield. Insulated conductors shall meet the requirements of UL 62 for type TFN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the vertical flame test requirements of UL 1277 and shall be rated type TC and shall be UL listed.

- F. **Ground Cable.** All ground cable shall be in conformance with specification Section 16450-Grounding. Ground cables shall be bare or green insulated, copper, 12 AWG minimum. Insulated cable shall meet the requirements for Single Conductor Power Cable above.
- G. The same manufacturer shall manufacture each type of cable listed above, multiple manufacturers for the same type of cable shall not be allowed.

2.3 COLOR CODING

- A. Provide color coding throughout the entire network for service, feeder, branch, control, and low energy signal circuit conductors. Color coding of conductors 10 AWG and smaller shall have factory impregnated color throughout its entire length. Conductors No. 8 AWG and larger gauge may be marked with color coding tape a minimum of 0.004 inch in thickness. Color shall be green for grounding conductors, and white or gray for neutrals. The color of conductors for different voltage systems shall be as follows:

SYSTEM	PHASE A	PHASE B	PHASE C	NEUTRAL	GROUND
120/240 one phase	black	red	---	white	green
208/120 three phase	black	red	blue	white	green
480/277 three phase	brown	orange	yellow	gray	green
Control and low energy	red	---	---	white	green

2.4 WIRE CONNECTIONS AND CONNECTING DEVICES

- A. Electrical Terminal and Splice Connectors
 1. The splicing of conductors is not permitted. Provide continuous conductor runs.
 2. For terminating conductors from #22 through #10 AWG use compression type connectors with barrels and locking spade type terminals. Conductor entry and crimp area shall be insulated with PVC insulation. Performance, construction, and materials shall be in conformance with UL standards for wire connectors and rated for 600 volts and 105 degrees Celsius. Connectors shall be manufactured from high conductivity copper and entirely tin-plated. Terminal barrels shall be brazed seam or seamless construction serrated on the inside surface and have a chamfered funnel entry to prevent strand fold-back.
 3. For terminating conductors #8 AWG and larger use high pressure compression type or set screw type lugs. Lugs shall be manufactured from high conductivity copper and entirely tin plated with a current carrying capacity equal to the conductors for which they are rated and must also meet UL requirements. All lugs above 4/0 AWG

shall be 2 hole lugs with NEMA spacing, rated for operation through 35 kV, and be of closed end construction to exclude moisture migration into the cable conductor.

4. Use solderless/re-usable lugs only when furnished with equipment such as control panels, furnished by others, where specification of compression type lugs is beyond the Contractor's control. Lugs must be manufactured to NEMA standards, with standard number and spacing of holes and set screws. Coat wires with electrical joint compound, T & B Kopr-Shield, Penn-Union Coal-Aid, or approved equal before being bolted into the connector.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Run all wires and cables in raceways unless otherwise noted.
- B. Conductors shall not be pulled into raceway until:
 1. Raceway system is complete and has been inspected and accepted by the Engineer.
 2. Plastering and concrete have been completed in affected areas.
 3. Raceway system has been freed of moisture and debris.
- C. Wire in panels, cabinets, and gutters shall be neatly grouped using nylon tie straps and shall be fanned out to terminate.
- D. For multiconductor or manufactures supplied cable not installed in raceways, terminate cable sheaths in watertight connectors designed for the specific cable and application.
- E. Conductors of No. 1 size and smaller shall be hand pulled. Pull conductors without exceeding manufacturer's recommendation for maximum pulling tension. Protect conductor insulation jacket at all times from kinks, scrapes, punctures, and other damage. Replace damaged conductors. Use lubricating compound to reduce pulling force. Use lubricating compound that is UL listed and compatible with the conductor- insulated jacket and with the raceway. The use of petroleum or grease based lubricants is prohibited.
- F. Support conductors in vertical risers with woven grips to prevent loading on conductor connectors.
- G. In conduits entering buildings or from areas where temperature change may cause condensation or moisture, seal between conductors and conduit after conductors are in place.

- H. When using color-coding tape apply with overlapping turns for a minimum length of two inches starting two inches back from the termination point.
- I. Provide full-length ground conductor in all conduits.
- J. Leave a minimum of six inches of free conductor at each connected outlet and a minimum of nine inches at unconnected outlets.

3.2 APPLICATION AND USE OF DIFFERENT CABLE TYPES

- A. **Single Conductor Power Cable.** Single conductor power cable shall be used for all ac power feeders and branch circuits.
- B. **Single Conductor Control Cable.** Single conductor or multiconductor control cable can be used interchangeably for all discrete control signals.
- C. **Multiconductor Control Cable.** Single conductor or multiconductor control cable can be used interchangeably for all discrete control signals.
- D. **Single Shielded Pair or Triad.** Single shielded pair or triad conductors or multiconductor shielded cables can be used interchangeably on analog signal lines of less than 24 volts.
- E. **Multiconductor shielded pair or triad.** Single shielded pair or triad conductors or multiconductor shielded cables can be used interchangeably on analog signal lines of less than 24 volts.
- F. **Ground Cable.** Use ground cable for all equipment ground and earth ground connections.

3.3 SPLICING AND TERMINATION

- A. Make all splices in pull or junction boxes or other approved enclosure. Do not pull splices into conduit. Keep splices to a minimum and in no case more frequent than 300 feet. Insulate all splices to protect conductors from entry of moisture and or contaminants and to provide insulation levels equal to the conductor insulation.
- B. Make all wire and cable terminations in UL approved lugs for the application.
- C. Connect circuit conductors of the same color to the same phase throughout the installation.
- D. Insulate connections/splices with a smooth even contour with a conformable 7 mil thick vinyl plastic insulating tape which can be applied under all weather conditions and is designed to perform in a continuous temperate environment up to 105 degrees Celsius. Use tape with resistance to abrasion, moisture, alkali's, acids, corrosion, and varying weather conditions (including sunlight) equal to Scotch 33+. Apply tape in conformance with manufacturer's recommendations and in addition, in successive half-lapped layers with sufficient tension to reduce its width to 5/8 of its original width. Do not stretch the last inch of wrap.

- E. First wrap connections or splices with irregular shapes or sharp edges protruding with 30 mil rubber tape to smooth the contour of the joint before being insulated with 33+ insulating tape specified in the previous paragraph.
 - 1. Apply the rubber tape in successive, half-lapped wound layers, highly elongated to eliminate voids, and in accordance with other manufacturer's recommendations on installation.
 - 2. Use rubber tape which is high voltage (69 kV) corona-resistant based on self-fusing ethylene propylene rubber and capable of operation at 130 degrees Celsius under emergency conditions. The tape must be capable of being applied in either the stretched or unstretched condition without any loss in either physical or electrical properties. The tape must not split, crack, slip, or flag when exposed to various environments. The tape must be compatible with all synthetic cable insulation. The tape must have a dissipation factor of less than 5 percent at 130 degrees Celsius, be non-vulcanizing, and have a shelf life of at least 5 years. The rubber tape shall be equal to Scotch 23 or 130C electrical splicing tape.
- F. Make splices made in wet or damp locations or below grade with watertight with special kits made for the application and compatible with types of cables employed.
- G. Make connections to lugs and bus bars, with corrosion resistant stainless steel bolts having non-magnetic properties with matching nuts, and a Belleville spring washer (stainless steel) to maintain connection integrity. Torque connections to the specified limits. Prior to bolting up the connection, brush electrical joint compound on the contact faces of the electrical joint.

3.4 SEPARATION OF CONDUCTORS

- A. Ensure that analog signals in one cable or conduit are of the same magnitude. The following are the different signal magnitudes:
 - 1. 0 to 100 mV
 - 2. 101 mV to 5 V
 - 3. 6 V to 75 V
- B. Run 24 Vdc discrete and analog signals in separate conduits from 115 Vac discrete signals and wiring.
- C. Neatly arrange wiring with terminations located directly opposite terminals. Leave wire loops not less than 6 inches long in each outlet box. Tape frayed terminals and exposed wires.

3.5 SPARE WIRES

- A. Notify the Engineer of any instance in which the spare conductor quantity cannot be installed. Tape off all spare conductors in the originating field junction boxes. Terminate and label in terminal boxes. Include all spare wires in conduit and wire schedules.

3.6 TESTING

- A. Cable assembly and testing shall comply with applicable requirement ICEA Publication No. S-68-516 and other relevant ICEA publications. Field tests shall be performed by a certified test organization acceptable to the cable manufacturer.
- B. All wiring shall be tested for continuity, polarity, undesirable ground, and origination. Test wiring for continuity using an ohmmeter. Replace any conductor or cable where the measured resistance exceeds the calculated resistance based on conductor size and length by more than 5 % unless otherwise directed by the engineer.
- C. Before terminating conductors test all conductors between phases and phase to ground for grounds and leakage between individual conductors using a megger capable of producing voltages of at least 500 volts for 300 volt insulation levels and 1000 volts for 600 volt insulation levels. If any conductor tested indicates resistance between conductors or between the conductor and ground of less than 10 megohms, replace the failed wire or cable unless otherwise directed by the engineer.
- D. Cables failing in the test will be replaced with new cable or repaired. Such kind of repair methods shall be as recommended by the cable manufacturer and shall be performed by persons qualified by the industry.
- E. Submit test results to the Engineer and certify all conductors have passed the required tests. Correct problems noted during these tests.

****END OF SECTION****

SECTION 16190

SUPPORTING DEVICES

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section describes the requirements of supporting devices for equipment, antennas, conduit, and cables.
- B. A registered Civil Engineer in the State of California is required to prepare calculation that show equipment anchorage and support structure requirements will comply with the UBC (latest edition), City Seismic requirements, and wind loading requirements for antenna masts.

1.2 SUBMITTALS

- A. Include the following information for each site in the submittal for this section:
 - 1. Shop drawings of parts and assembly.
 - 2. Descriptive data sheets, literature, bulletins, and related data annotated as necessary to describe the antenna tower or pole and related equipment to be furnished.
 - 3. Wind Zone information.
 - 4. Specific arrangement, dimension drawings, erection and assembly drawings for the antenna tower or pole supplied. This shall include all engineering drawings and calculations for the antenna tower or pole, pier foundation, anchor bolts, etc., as prepared by a registered Professional Engineer.

1.3 SITE CONDITIONS

- A. Determine to your own satisfaction the location and nature of all surface and subsurface obstacles and the soils and water conditions which will be encountered during the construction.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. Do not use expansive screw anchors, shields, or other fastening items containing lead or other material that might loosen or melt under fire conditions. Do not use power- actuated fasteners and devices.
- B. Equipment or enclosure support devices.

1. Mounting brackets and support channels shall be stainless steel, unless otherwise specified on the drawings. Fasteners used to mount equipment outdoors shall be stainless steel and designed for use with the support channels.
 2. Provide supporting devices manufactured by Unistrut, Bee-Line, Kindorf, or approved equal.
- C. Raceway Supports
1. Except as noted herein, supports and hangers shall be stainless steel.
 2. Fasteners shall be expansion bolts or inserts for concrete, toggle bolts for hollow masonry or frame construction and preset inserts for pre-stressed concrete.
 3. For conduits supported on surface, provide straps with holes for one or two fasteners and shaped to fit conduit size.
 4. At structural steel members support raceway with hot dip galvanized beam clamps. Drilling or welding may be used only where indicated on the Drawings.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Install fastenings and supports as required for each type of equipment, cables and conduits, and to manufacturer's installation recommendations.
- B. Provide surface mounted supports for 2 or more conduits on channels at a maximum of 3 foot intervals. Provide metal brackets, frames, hangers, clamps and related types of support structures as required to support conduit and cable runs. Do not use wire lashing or perforated strap to support or secure raceways or cables.
- C. Provide adequate support for raceways, conduit and cables dropped vertically to equipment where there is no wall support.
- D. Do not use supports of equipment installed for other trades for conduit or cable support except with permission of the Resident Engineer.
- E. Install inert spacers for aluminum support brackets or channels directly in contact with concrete to reduce chemical reaction between support and concrete.

3.2 REMOTE CONTROL PANEL AND ANTENNA MAST

- A. The Contractor shall be responsible for the following installation work:

1. Mounting of Transmitter Panel and Flow Transmitter Panel.
2. At the base, connect to a 3/4 inch diameter, 10 foot, copper ground rod.

B. Provide concrete foundation as required indicated on drawings and certified by a California registered Professional Engineer.

3.3 RACEWAY SUPPORTS

A. Support raceway at intervals and at locations as required by the NEC. Do not use perforated straps or plumbers tape for conduit supports. Independently support raceways from the structure.

B. Install exposed raceways on walls below grade or in damp, wet, or corrosive locations with standoff brackets providing a minimum of 1/4 inch air space between the raceway and the mounting surface.

C. Where raceway may be affected by dissimilar movements of the supporting structures or medium, provide flexible or expansion devices.

****END OF SECTION****

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section describes the requirements for equipment identification tags.
- B. Identify and label each raceway, piece of equipment, and conductor.
- C. Develop a schedule for labels showing the legend of each as shown on the Drawings. In the absence of specific data on the Drawings, develop legends from the nature of the service or system. Arrange the schedule to produce a legible comprehensive identification system.

1.2 SUBMITTALS

- A. Submit label schedule.

PART 2 -- PRODUCTS

2.1 EQUIPMENT IDENTIFICATION

- A. Use Micarta black letters on a white background unless otherwise specified for a specific application. Electrical enclosure nameplates shall be a minimum of 1 inch high by 3 inches wide with 0.125 inch letters. Engrave nameplates as shown on the Drawings or as approved on the submittal.
- B. Nameplates shall be fastened securely by fasteners of stainless steel, screwed into inserts or tapped holes as required.
- C. Provide labels manufactured by the Brady Identification Systems Division, Safety Sign Company, Westline Products Company, or approved equal.

2.2 RACEWAY IDENTIFICATION

- A. Provide labels manufactured by None Such Enterprises, or approved equal.
- B. Identification tape for protection of buried electrical installation shall be SDM-105.

2.3 CONDUCTOR IDENTIFICATION

- A. Provide wire markers that are clip sleeve or sleeve type, made of PVC, nylon, or delrin, white

in color, with black letters impressed in the material. On wire too large for the standard sleeve sizes, provide sleeve type markers inserted on a cable tie and the tie then installed around the wire.

- B. Acceptable wire markers are Tyton Corporation Tygrup and Ty-Clip, Brady Clip-Sleeve, Panduit and Omnigrip, or approved equal.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Furnish and install nameplates on all field mounted devices, equipment and instruments supplied whether mounted inside an enclosure or field mounted. Securely fasten nameplates to each device or to a conduit clamp located near the device with 16 gage stainless steel wire or nylon self-locking straps.
- B. Indicate the device's name (i.e., BRM4201PI or ELLC300QA) based on the input/output point listing.

3.2 RACEWAY IDENTIFICATION

- A. Identify exposed raceways and raceways concealed above removable ceilings at each end within 12 inches of point to termination.
- B. Provide factory manufactured identifying labels with colored paper, machine printed with an identifying legend laminated between two sheets of vinylite plastic formed to completely encircle the raceway. Match the sizes of the labels with the raceway on which they are to be applied. Install labels in accordance with manufacturer's instructions.
- C. For legends to be used in the labels, indicate the system voltage and what it serves or type of service. The legend shall appear in a minimum of one inch high white letters on a black background for raceways 2-1/2 inch and smaller diameter and two inch high letters for raceways larger than 2-1/2 inch diameter.
- D. Install identification tape directly above buried raceway; Install tape 8 inches below grade and parallel with raceway to be protected.

3.3 EQUIPMENT IDENTIFICATION

- A. All panels and devices powered from an external source shall be provided with a nameplate which indicates the power source and circuit number for the panel or device.
- B. Label feeder units in panelboards, switchboards, disconnects, and motor control centers to identify the enclosure or piece of equipment and to indicate the motor device, outlet, or circuit controlled or monitored. Attach nameplates to inside surfaces with adhesive and to

the outside surface with round head, self-tapping stainless steel screws. Nameplates shall be two-color laminated plastic not less than 1/16 inch thick, machine engraved to show white letters not less than 1/4 inch high on a black background.

- C. Type branch circuits in lighting panelboards on a card suitable for the card frame furnished with the panel. The card shall bear the panel designation listed on the Drawings where this information is given, as well as indicate what each circuit controls.

3.4 CONDUCTOR IDENTIFICATION

- A. Identify power conductors terminating in panelboards, cabinets, motor control centers, and special service outlets at each end and in intervening junction and pull boxes. Where feeder conductors pass through a common box, tag the feeder to indicate the electrical characteristics, circuit number and panelboard designation. Locate labels near the conductor ends for terminals and on exposed portions of conductor within pull and junction boxes.
- B. Identify control wiring and instrument power and signal wiring at each end of each wire by a number conforming with the following:
 - 1. Base wire numbers on the instrument or equipment name shown on the Drawings, the I/O list, or stated in the Specifications. If cables are multi-conductor, number the individual wires. Where it is impractical to maintain the same wire numbers throughout, install a terminal block at the junction of the different numbered wires. On each side of the terminal block identify each associated wire number with a label either typed or written in with permanent ink.
 - 2. Tag wires at both ends with the same notation.
- C. All conduction identification numbers shall show on shop drawings.

****END OF SECTION****

SECTION 16450

GROUNDING

PART 1 -- GENERAL

1.1 SUMMARY

- A. This section describes the requirements for grounding.

1.2 SUBMITTALS

- A. Manufacturer's Catalog Information for all products listed in Part 2.
- B. Testing results.

PART 2 -- PRODUCTS

2.1 GROUND CONNECTIONS:

- A. Water system piping clamps: Cast bronze clamps with stainless steel screws.
- B. Cable lugs: Shall be wrought copper with high pressure crimp sleeve for the conductor.
- C. Ground rod connections: Exothermic weld or high pressure crimp type.
- D. Exothermic welds: UL approved and or listed systems with mold, weld cartridges, and weld powder specifically approved for the particular application.
- E. Terminal lugs for shielded instrument cable: Crimp type sized to meet the specific shield requirements.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Install the grounding electrode system with all required components in accordance with NEC Article 250.
- B. Provide and install at least one ground rod at each instrument or panel rack. The length of rods forming an individual ground array shall be equal in length and shall be of the quantity required to obtain a ground resistance of less than 5 ohms.
- C. Unless otherwise specified, ground all non-current carrying metallic parts of electrical

equipment, support structures, raceway systems, and the neutral of all wiring systems in accordance with the NEC and other applicable codes and with the manufacturer's recommendations.

- D. All grounds and ground systems shall be bonded together.
- E. Ground conductor for connection to ground rod shall be stranded copper and connected by the exothermic welding process. Earth buried ground conductors shall not be insulated. File or sand surfaces before connecting ground to ensure good metal to metal contact.
- F. Bond the grounding conductors to metallic enclosures at each end and to all intermediate metallic enclosures. Where equipment contains a ground bus, extend and connect grounding conductors to that bus. Run ground conductors inside conduits enclosing the power conductors.
- G. Make connections of grounding conductors to circuits 20 amps or above by a solderless terminal and a 5/16 minimum bolt tapped to the motor frame or equipment housing. Ground connections to smaller equipment may be made by fastening the terminal to a connection box. Connect junction boxes to the equipment grounding system with grounding clips mounted directly on the box or with 3/8-inch machine screws. Remove all paint, dirt, or other surface coverings at grounding conductor connection points so that good metal to metal contact is made.

3.2 PANEL AND ENCLOSURE GROUNDING

- A. Bond panels and enclosures to building grounds.
- B. Provide new ground rod where ground cable routed with conduit is not bonded to earth ground within 50 feet. Bond equipment-grounding conductors to earth ground through the panel.

3.3 INSTRUMENT SIGNAL SHIELD GROUNDS

- A. Ground instrument signal shields at one location only.
- B. Termination of each shield drain wire shall be on its own terminal screw. All of the terminal screws in one rack or panel shall be jumpered with No. 16 solid tinned bare copper wire; connection to ground shall be accomplished with a No. 12 green insulated conductor to the main ground bus
- C. As a general rule, ground shields at local or area control panels nearest the instrument. If no panel is nearby, ground shields at the instrument power source. If a signal passes through several panels, ground at the panel with the most loops.
- D. At the ungrounded end, trim back and insulate shield.

- E. If a signal passes through a junction box or barrier strip, maintain shield continuity.

3.5 TESTING

- A. All tests shall be performed in the presence of the Resident Engineer.
- B. Perform a thorough visual and mechanical inspection to ensure all items are in place and connected with all termination made in an approved manner.

****END OF SECTION****

SECTION 16485

SOLAR POWER SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section describes materials, testing, and installation of the solar power system.

1.2 RELATED SECTIONS

- A. Section 16010 – Basic Electrical Requirements.

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with the General Conditions.
- B. Show bill of material, ratings, and characteristics for all electrical components, poles, and enclosures.
- C. Submit system calculations, complete wiring diagrams, and scaled panel internal elevation views of electrical equipment.

PART 2 - MATERIALS

2.1 GENERAL

- A. The Contractor shall provide a complete solar power system package, including a solar electric array, mounting structure, system storage batteries, two radio systems, and all wiring and hardware necessary for a safe and complete installation. The solar power system shall be designed and fabricated by a single supplier and shipped as an integrated assembly.
- B. The Solar Power Cabinet shall be provided with identified terminal strips for the connection of all external conductors. Provide sufficient terminal blocks to connect 25% additional conductors for future use. Termination points shall be identified in accordance with accepted shop drawings.
- C. All internal wiring shall be factory-installed and shall be contained in plastic wireways having removable covers. Control conductors shall be provided in accordance with Section 16120 – Wires and Cables.
- D. The average power consumption for the solar power system shall be calculated as follows:

$$\text{RCP (PLC and Radio)} = 80 \text{ Watts} \times 24\text{hrs each day} @ 24 \text{ Vdc}$$

RCP (Heater) = 100 Watts X 2hrs each day @ 24 Vdc
Total Daily Load = 88.3 Amp Hours each Day @ 24 Volts DC (nominal)

2.1 SOLAR POWER SYSTEM

A. System Configuration:

1. Solar Array and Mounting Structure: The solar array will have two (2) Silfab SLG360M/360-Watt solar modules. The solar module shall be rated with a peak output of 9.2 Amps at 39.3 Volts under Standard Test Conditions of 1000W/m² Irradiance; 25°C; and Air Mass 1.5. The two (2) solar modules shall be wired in parallel to provide a total of 18.4 Amps at 39.3 Volts Peak Output. The array will have a total of 720 - Watts output at 24 Volts nominal.
2. The solar modules are to be pole mounted on a 3-inch pole with concrete foundation. The Contractor is responsible to design the mounting structure in accordance with the California Building Code. The structure will have a field adjustable 60 degree tilt angle off the horizontal plane. This will provide optimum charging of the batteries during the month of December when the sun angle is at the lowest point of the year. The modules will be attached with stainless steel hardware. Mounting hardware shall be pole top system by Sunwize Model 018875; or approved equal.
3. Battery Storage System and Enclosure: The 720-Watt solar array will charge a maintenance free battery bank. The storage capacity of each 12 volt battery shall be at least of 105 Amp Hours at the 20-Hour discharge rate. There will be (8) eight batteries wired in series-parallel to provide a total storage of 420 Amp Hours at 24 Volts DC Nominal. The batteries and charge controller are to be housed in a ventilated enclosure as indicated. The enclosure shall have items indicated on the drawings.
4. System Charge Controller: The system charge controller shall be a Morningstar Prostar 30M Pulse Width Modulated Controller; or approved equal. The controller is rated at 30 Amps of solar charging current at 24 volts DC. The charge controller has an automatic low voltage disconnect circuit which will automatically disengage the loads during low state of charge conditions.

Both the input and outputs shall be fully protected with transient suppression devices to minimize damage from induced transients such as lightning. The system controller will feature; microprocessor based control circuitry; LED charging indicators; temperature compensation and low voltage disconnect. The unit will also include metering.
5. System Cables: System wiring and equipment grounding shall be provided to complete the system installation. All cables necessary to interconnect the array

to the system controller, controller to battery shall be included with the system. All exposed cables shall have sunlight resistant jackets to protect them from the weather and the environment.

6. System Cables: System wiring and equipment grounding shall be provided to complete the system installation. All cables necessary to interconnect the array to the system controller, controller to battery shall be included with the system. All exposed cables shall have sunlight resistant jackets to protect them from the weather and the environment.
7. Documentation: An owner's manual of system documentation including installation and operations/maintenance procedures, electrical wiring schematics with hookup details, equipment layout and foundation drawings, and equipment data/specification sheets shall be provided.

2.2 MOUNTING POLE

- A. Provide and install a mounting pole and concrete base as shown on the drawings.

2.3 CONCRETE BASE FOR MOUNTING POLE AND SOLAR POWER CABINET

- A. Concrete shall be in accordance with Table 201-1.1.2. of the Greenbook.

PART 3- EXECUTION

3.1 INSTALLATION

- A. Installation requirements:
 1. The necessary location and height of the antenna shall be field verified by the Contractor prior to final installation. Proper grounding and lightning protection for the antenna shall be installed. Ninety-degree cable bends shall not be used.
 2. Provide all wiring, labor, materials, and equipment necessary for the installation setup, testing, and successful operation of the equipment.
 3. The Contractor shall perform testing of the solar interface system in the presence of the City's Representative. The Contractor shall be responsible for performing all field testing necessary to construct a complete and operable system.

****END OF SECTION****

SECTION 16640

CATHODIC PROTECTION SYSTEM

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES

- A. The WORK of this Section includes providing a complete cathodic protection system for the following structure as outlined in this Section and on the Drawings:
 - 1. Phase 2A of the Mid-City Pipeline consisting of approximately 820 linear feet of 66-inch mortar-lined and tape coated steel pipeline. The exterior of the pipeline shall have a concrete armor coat over the tape, field applied mortar over the tape coated joints and field applied mortar over any pipeline fittings or appurtenances that are not encapsulated in petrolatum wax tape.
- B. Electrical isolation of the structure from adjacent metallic structures, steel reinforced concrete structures, structures of dissimilar metal or dissimilar coatings, conduits and all other metallic components that may impact the operation of the cathodic protection system.
- C. Bonding of all non-welded, non-insulating pipe joints with stranded copper cables.
- D. Testing of system during installation including electrical continuity of the pipeline.
- E. Cleanup and restoration of work site.
- F. Testing the system after installation and backfill (Final System Checkout).

1.2 DEFINITIONS

- A. CONTRACTOR: The licensed prime installer selected by the CITY to install the pipeline
- B. CITY: The City of San Diego
- C. CORROSION ENGINEER: A qualified CORROSION ENGINEER retained by the CONTRACTOR who is either a Registered Professional CORROSION ENGINEER or NACE-international Certified CATHODIC PROTECTION SPECIALIST.
- D. ENGINEER: The City of San Diego's Resident ENGINEER or designated representative
- E. CITY'S CORROSION ENGINEER: The ENGINEER'S appointed representative from the City's Corrosion Section

- c. RP0375 Wax Coating Systems for Underground Piping Systems
- d. TM0497 Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Piping Systems

B. Whenever the Drawings or these Specifications require a higher degree of workmanship or better quality of material than indicated in the above codes and standards, these Drawings and Specifications shall prevail.

1.5 PERMITS AND JOB ACCESS

- A. Prior to the start of construction, the CONTRACTOR shall apply to the required authorities for permits required for installation of the cathodic protection system.
- B. The CONTRACTOR shall contact Underground Service Alert prior to commencing construction to locate existing utilities in the area of construction. Existing utilities include, but are not limited to, water lines, gas lines, telephone, street lights, sewer and storm drains and overhead and underground electric utilities.
- C. Traffic control shall satisfy the requirements of the governing locality.

1.6 QUALITY ASSURANCE

- A. All work must be conducted by qualified personnel working under the direct supervision of a CORROSION ENGINEER. The CONTRACTOR doing the electrical installations shall have proper valid State of California licenses.
- B. All testing required to be performed by a “qualified corrosion technician” shall be performed by a NACE Level 2 CP Technician under the supervision of a Corrosion Engineer.

1.7 SUBMITTALS

- A. The following shall be submitted to the ENGINEER prior to any equipment installation.
 - 1. Catalog cuts, bulletins, brochures, or data sheets for all materials specified herein.
 - 2. Certification that the proposed equipment and materials meet the Specifications and the intent of the Specifications.
 - 3. Schedule including the expected start date and planned completion date.
- B. The following shall be submitted to the ENGINEER after completion of the WORK.
 - 1. Wire connection testing.

2. Insulating joint testing, before and after backfill.
3. Casing insulator testing, before and after backfill.
4. System check-out report.
5. Record Drawings shall be submitted to and approved by the ENGINEER before the WORK is considered complete.

1.8 INTERFERENCE AND EXACT LOCATIONS

- A. The locations of cathodic protection equipment, test stations, devices, outlets and appurtenances as indicated are approximate only. Exact locations shall be determined by the CONTRACTOR in the field subject to the approval of the ENGINEER.
- B. The CONTRACTOR shall field verify all data and final locations of work done under other Sections of the Specifications required for placing of the electrical work.
- C. In case of interference with other work or erroneous locations with respect to equipment or structures, the CONTRACTOR shall furnish all labor and materials necessary to complete the WORK in an acceptable manner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials installed must be new. All equipment and materials supplied shall be similar to that which has been in satisfactory service for at least 5 years.

2.2 CONCRETE TRAFFIC VALVE BOXES

- A. Traffic valve boxes shall be rated to withstand AASHTO H20 traffic loading. The traffic valve boxes shall be G5 Utility Boxes as manufactured by Christy Concrete Products, Inc., No. 3RT Utility Box as manufactured by Brooks Products or approved equivalent. Traffic box covers for test stations shall be cast iron with welded bead legend and labeled "CP TEST". Concrete Traffic Valve Boxes and traffic box lids shall conform to SDW-128 and City of San Diego standards.

2.3 CONCRETE

- A. Concrete mix shall conform to the requirements specified in the City of San Diego Whitebook Section 201

2.4 UTILITY WARNING AND IDENTIFICATION TAPE

- A. The warning and identification tape shall be 3" wide and consist of a minimum 5.0 mil, five-ply 100% virgin polyethylene which is acid, alkaline and corrosion resistant. Tape shall have a minimum 20 gauge solid aluminum foil core, adhered to a 2.55 mil polyethylene backing.
- B. Tape shall be red and state "Caution Electric Line Buried Below".
- C. Utility warning and identification tape shall conform to the requirements specified in the City of San Diego Standard Drawings, SDM-105.

2.5 WIRES

- A. Conductors shall consist of stranded copper of the gauge indicated. Wire sizes shall be based on American Wire Gauge (AWG). Copper wire shall be in conformance with ASTM Designations B3 and B8.
- B. All wires terminating in a test station shall have a wire identifier attached within 4 inches from the end of wire at the terminal board, prior to backfill, as specified under "Wire Identification".
- C. High molecular weight polyethylene (HMWPE) insulating jackets shall conform to ASTM D1248.
- D. Test Station: Single-conductor, No. 6 AWG stranded copper with HMWPE insulation. Multi-stranded test leads or wire splicing is not allowed.
- E. Insulation Colors: per Contract Documents.

2.6 WIRE IDENTIFIERS

- A. Wire identifiers shall be circular brass tags with a minimum diameter of 1-inch. Brass tags shall have a high resistance to oils, solvents and mild acids, and shall be securely tied to the appropriate wire. Brass tags shall be stamped with alpha-numeric characters for pipe/structure identification. The letters and numbers shall be printed, minimum 3/16 inch in size.

2.7 EXOTHERMIC WELDS

- A. Exothermic welds shall be in accordance with the manufacturer's recommendations. Exothermic welds shall be Cadweld, as manufactured by Erico Products, Inc. or Thermoweld as manufactured by Continental Industries, Inc., or approved equivalent. Duxseal packing as manufactured by Johns-Manville or approved equivalent shall be used where necessary to prevent leakage of molten weld metal.
- B. The shape and charge of the exothermic weld shall be chosen based on the following parameters:
 - 1. Pipe material

2. Pipe size
3. Wire material/size and requirement for sleeves
4. Number of strands to be welded
5. Orientation of weld (vertical or horizontal)

2.8 CABLE-TO-PIPE COATING MATERIAL

- A. Coating material for exothermic weld connections to the mortar coated/tape wrapped steel pipelines shall be two part epoxy resin such as Scotchcast Electrical Resin 8 manufactured by the 3M Company, or approved equivalent.
- B. Coating material for exothermic weld connection to bare steel casings shall consist of a weld cap with integrated primer. The weld cap shall be a 10-mil thick durable plastic sheet that has a dome filled with a moldable compound to assure complete encapsulation of the exothermic weld and a layer of elastomeric adhesive with integrated primer. Adhesion to steel shall be at least 10 lb/in per ASTM D1000. Weld cap with integrated primer shall be Handy Cap IP manufactured by Royston or equivalent for wire size up to 8 AWG and Handy Cap XL IP manufactured by Royston or approved equal for wire size up to 2 AWG.

2.9 DIELECTRIC INSULATING FLANGE KITS

- A. Insulating flange gaskets shall include full faced gaskets, insulating sleeves and washers and steel bolts, nuts and washers. The complete assembly shall have a pressure rating equal to or greater than the flanges between which it is installed. Sleeves, gaskets and insulating washers shall be G-10 composite materials and have a dielectric constant of 300 Volts per mil, minimum. Steel washers shall fit well within the bolt facing on the flange. Insulating washers shall fit within the bolt facing the flange over the outside diameter of the sleeve.

2.10 PETROLATUM TAPE

- A. Petrolatum tape system shall be Trenton Primer and #1 Wax-tape, as manufactured by Trenton Corp., or Denso Paste and Densyl Tape by Denso North America, Inc., or approved equivalent.

PART 3 - EXECUTION

3.1 STORAGE OF MATERIALS

- A. All materials and equipment to be used in construction shall be stored in such a manner to be protected from detrimental effects from the elements. If warehouse storage cannot be provided, materials and equipment shall be stacked well above ground level and protected

from the elements with plastic sheeting or other method as appropriate.

3.2 EXCAVATION AND BACKFILL

- A. Buried wires shall have a minimum cover of 24-inches.
- B. Caution tape shall be installed above buried wire. Caution tape shall be installed a minimum of 6 inches above underground wires and conduits. See Standard Drawing SDM-105.

3.3 TEST STATIONS

- A. Test stations shall be installed at the approximate locations shown on the Drawings. Flush mounted test stations shall be located behind the curb and other areas not subject to vehicular traffic to allow for safe access by City monitoring personnel which will not require traffic control. The CONTRACTOR shall field verify final location of the test stations. Wire identifiers shall be placed on all wire prior to backfill and installation of test stations.
- B. Installation of test stations shall be done in the presence of the ENGINEER. A minimum of 48 hours notice shall be given by the CONTRACTOR to the ENGINEER prior to installation of a test station. Installation of test stations shall begin early enough in the day to ensure completion of the installation during regular working hours.
- C. The CONTRACTOR shall provide global positioning system (GPS) coordinates of each test station location with a minimum accuracy of 1 meter or 3 feet. The CONTRACTOR shall submit the GPS coordinates of the test stations to the ENGINEER after installation.

3.4 WIRES

- A. Buried wires shall be laid straight without kinks. Each wire run shall be continuous in length and free of joints or splices, unless otherwise indicated. Care shall be taken during installation to avoid punctures, cuts or other damage to the wire insulation. Damage to insulation shall require replacement of the entire length of wire at the CONTRACTOR's expense.
- B. 12 to 18 inches of slack (coiled) shall be left for each wire at each flush-to-grade test station. Wire slack shall be sufficient to allow removal of wire extension for testing. Wire shall not be bent into a radius of less than 2 inches.

3.5 WIRE IDENTIFIERS

- A. All wires shall be coded with wire identifiers.
- B. Wire identifiers shall be placed on the wires prior to backfill.

3.6 EXOTHERMIC WELD CONNECTIONS

- A. Exothermic weld connections shall be installed in the manner and at the locations indicated. Coating materials shall be removed from the surface over an area of sufficient size to make the connection. The surface shall be cleaned to bare metal by grinding or filing prior to welding the conductor. The use of resin impregnated grinding wheels will not be allowed. A copper sleeve shall be fitted over the conductor. Only enough insulation shall be removed such that the copper conductor can be placed in the welding mold.
- B. The CONTRACTOR shall be responsible for testing all test lead welds. The ENGINEER, at his or her discretion, shall witness these tests.
- C. After the weld has cooled, all slag shall be removed and the metallurgical bond shall be tested for adherence by the CONTRACTOR. A 22-ounce hammer shall be used for adherence testing by striking a blow to the weld. Care shall be taken to avoid hitting the wires. All defective welds shall be removed and replaced.
- D. After backfilling the pipe, all test lead pairs shall be tested for broken welds using a standard ohmmeter. The resistance shall not exceed 150% of the theoretical wire resistance as determined from published wire data.
- E. The CONTRACTOR shall inspect both the interior and exterior of the pipe to confirm that all coatings and linings removed or damaged as a result of the welding have been repaired. The CONTRACTOR shall furnish all materials, clean surfaces and repair protective coatings and linings damaged as a result of the welding. Repair of any coating or lining damaged during welding shall be performed in accordance with the coating or lining manufacturer's recommendations.
- F. All exposed surfaces of the copper and steel shall be covered with insulating materials as indicated.
- G. Mortar shall be applied to the project pipeline at all wire-to-pipe connections. The mortar shall match the exterior mortar. Coating repairs shall be performed in accordance with the coating Manufacturer's recommendations.

3.7 PETROLATUM TAPE SYSTEM APPLICATION

- A. Petrolatum tape system shall be applied on insulating joints and as indicated in the Drawings. Petrolatum tape system shall be applied in accordance with NACE RP0375, and these Specifications. The materials shall be applied according to the Manufacturer's recommendations.
- B. All loose scale shall be removed from the surface to be coated with hand tools (wire brush, scraper, rags). Debris and moisture shall be wiped from surface with clean rag. Petrolatum tape shall be applied immediately after applying the primer, using a 1-inch overlap. A spiral wrap shall be used and a slight tension shall be applied to ensure that there are no air pockets

or voids. After applying the tape, the applicator shall firmly press and smooth out all lap seams and crevice areas. The tape shall be in tight intimate contact with all surfaces.

3.8 WIRE CONNECTIONS

- A. After installation, all wire connections shall be tested at the test station locations, by the CONTRACTOR, to ensure that they meet the requirements and intent of the Contract Documents.

3.9 INSULATING JOINTS

- A. Insulating joints shall be installed to effectively isolate metallic piping from foreign metallic structures. The CONTRACTOR shall test the performance of these insulating joints before and after backfill.
- B. Before backfill, the CONTRACTOR shall test the insulating joint using a Gas Electronics Model No. 601 Insulation Checker, or approved equivalent. If the testing results indicate less than 100% insulation, the insulating joints shall be repaired and retested at the CONTRACTOR's expense.
- C. After backfill, testing shall be performed by measurement of native pipe-to-soil potentials at both sides of the insulating joint. If the difference in native pipe-to-soil potentials on both sides of the insulating joint is within +/-50 milliVolts, then additional testing shall be performed as follows. Temporary cathodic protection current shall be circulated on the project pipeline side of the insulating joint. "On" and "Instant Off" pipe-to-soil potentials shall be measured on the other side of the insulating joint. If the "Instant Off" potential is more negative than the native potential, the insulating joint shall be considered deficient and shall be repaired and retested at the CONTRACTOR's expense.

3.10 CASING INSULATORS

- A. Casing insulators shall be installed to effectively isolate the pipeline from the casing. The CONTRACTOR shall test the performance of the casing insulators before and after backfill.
- B. After backfill, testing shall be performed by measurement of native pipe-to-soil potentials on the pipeline and the casing at both ends of the casing. If the difference in native pipe-to-soil potentials is greater than 50 milliVolts, the casing shall be considered isolated from the pipeline. If the difference in native pipe-to-soil potentials between pipe and casing is less than 50 milliVolts, then additional testing shall be performed as follows. Temporary cathodic protection current shall be applied to the pipeline. "On" and "Instant Off" pipe-to-soil potentials shall be measured on the pipeline and the casing at both ends of the casing. If the "Instant Off" potential of the casing is more negative than the native potential of the casing, the pipe is not isolated from the casing and shall be repaired and retested at the CONTRACTOR's expense.

3.11 CONTINUITY TESTING

- A. Continuity testing of all joints and pipe sections having in-line valves shall be performed by the CONTRACTOR's qualified corrosion technician as defined in this section after backfill. The electrical continuity test may additionally be performed before backfill at the CONTRACTOR's option.
- B. The pipe shall be tested for electrical continuity. Continuity shall be verified using the linear resistance method. Each test span shall have two test leads connected to the pipe at each end. Existing test stations may be used. A direct current shall be applied through the pipe using two of four test leads. The potential across the test span shall be measured using the other two test leads. The current applied and voltage drop shall be recorded for a minimum of three different current levels.
- C. The theoretical resistance of the pipe shall be calculated. It shall take into account the pipe material, segment length, wall thickness and number of joint bonds within the span.
- D. Acceptance of the test span: The average measured resistance shall be compared to the theoretical resistance of the pipe. If the measured resistance is greater than 150% of the theoretical resistance, then the welded joints shall be considered deficient and shall be repaired and retested at the CONTRACTOR's expense. If the measured resistance is less than 100% of the theoretical resistance then the test and/or calculated theoretical resistance shall be considered deficient and the test span shall be retested and/or recalculated at the CONTRACTOR's expense. If the piping forms a loop which allows current to flow both in and out of the test span, then consideration shall be made for current circulating through both the loop and the test span.

3.12 SYSTEM CHECKOUT

- A. Upon completion of the installation, the CONTRACTOR shall provide testing of the completed system by a qualified corrosion technician. The data shall be reviewed by a Corrosion Engineer to ensure conformance with the Contract Documents, NACE SP0169, and NACE RP0286.
- B. The testing described herein shall be in addition to and not substitution for any required testing of individual items at the Manufacturer's plant and during installation.
- C. Testing shall be performed at all test leads of all test stations and at the locations of exposed pipe as soon as possible after installation of the cathodic protection system.
- D. Testing shall include the following and shall be conducted in accordance with NACE TM0497:
 - 1. Measure and record native pipe-to-soil and casing-to-soil potentials at all test locations.
 - 2. Verify electrical isolation at all insulating joints and casing insulators per NACE SP0286.
 - 3. Confirm electrical continuity of the pipeline or cathodically protected structure in

accordance with this Section.

4. Measure and record the "On" and "Instant Off" potentials at each location.
- E. Test results shall be analyzed to determine compliance with NACE SP0169.
- F. Test results shall be analyzed to determine if stray current interference is present. Stray current interference is defined as a +/-50 millivolt shift in a pipeline's pipe-to-soil potential that is caused by a foreign current source. Stray current interference shall be tested on the project pipeline and foreign pipelines that have a reasonable chance of being affected by stray currents.
- G. The CONTRACTOR shall provide a written report, prepared by the Corrosion Engineer, documenting the results of the testing and recommending corrective work, as required to comply with the Contract Documents. Any deficiencies of systems tested shall be repaired and re-tested by the CONTRACTOR at no additional cost to the CITY.

PART 4 - PAYMENT

4.1 CATHODIC PROTECTION SYSTEM

The payment for a complete cathodic protection system shall be paid under the lump sum bid item and shall include all work necessary for the installation and testing of a fully operational cathodic protection system.

**** END OF SECTION ****

SECTION 16950

ELECTRICAL TESTS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The CONTRACTOR shall test, commission and demonstrate that the electrical work satisfies the criteria of these Specifications and functions as required by the Contract Documents.

1.2 GENERAL

- A. The Work of this Section includes furnishing the labor, equipment and power required to support the testing in other Divisions of these Specifications. This scope may require the CONTRACTOR to activate circuits, shutdown circuits, run equipment, make electrical measurements, replace blown fuses, and install temporary jumpers.

1.3 RELATED SECTIONS

- A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.
 - 1. Section 16010 - Basic Electrical Requirements

1.4 CODES

- A. The Work of this Section shall comply with the current editions of the National Electrical Code as adopted by the City of San Diego.

1.5 STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:
 - 1. NETA National Electrical Testing Association
 - 2. ICEA Insulated Cable Engineers Association

1.6 TESTING

- A. The following test requirements are intended to supplement test and acceptance criteria that may be stated elsewhere.

1. Test ground interrupter (GFI) receptacles and circuit breakers for proper operation by methods sanctioned by the receptacle manufacturer.
 2. A functional test and check of all electrical components is required prior to performing subsystem testing and commissioning. Compartments and equipment shall be cleaned as required by other provisions of these Specifications before commencement of functional testing. Functional testing shall comprise:
 - a. Visual and physical check of cables and connections associated with all new and modified equipment.
 3. Complete ground testing of all grounding electrodes prior to operating the equipment. Use a three-point ground test.
- B. Subsystem testing shall occur after the proper operation of alarm and status contacts has been demonstrated or otherwise accepted by the Resident Engineer and after process control devices have been adjusted as accurately as possible. It is intended that the CONTRACTOR will adjust limit switches and level switches to their operating points prior to testing.
- C. Provide ground resistance tests in the presence of the Resident Engineer and submit results. Use a ground resistance meggar "Earth" tester with a maximum of 0-50 scale. Use the full of potential method or the three terminal method as described by Biddle or NETA Standards.
- D. General: Carry out tests for individual items of materials and equipment indicated in other Sections.
- 1.7 COMMISSIONING
- A. Commissioning shall not be attempted until all subsystems have been found to operate satisfactorily; commissioning shall only be attempted as a function of normal plant operation in which plant process flows and levels are routine and equipment operates automatically in response to flow and level parameters or computer command, as applicable. Simulation of process parameters will be considered only upon receipt of a written request.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

**** END OF SECTION**

SUPPLEMENTARY SPECIAL PROVISIONS
APPENDICES

APPENDIX A

FINAL MITIGATED NEGATIVE DECLARATION



(619) 446-5460

**FINAL MITIGATED
NEGATIVE DECLARATION**

PTS No. 406277

WBS No. S-11026.02.06

SCH. No.: 2015111024

SUBJECT: MONTEZUMA PIPELINE/MID-CITY PIPELINE PHASE 2: A SITE DEVELOPMENT PERMIT for the installation of approximately 1.16 miles of new water pipelines which consists of 5,680 linear feet (LF) of new 66" diameter Cement Lined and Coated Steel transmission main and 422 LF of 8-inch PVC distribution main. The 66-inch transmission main will run from the Alvarado Water Treatment Plant (AWTP), located at the intersection of Lake Murray Boulevard and Kiowa Drive, to the intersection of 68th Street and El Cajon Boulevard. The northern terminus of the pipeline will be connected to Existing Valve Vault No. 3 located where the Earl Thomas Reservoir Outlet Pipeline intersects the Clear Wells Interconnect Pipeline at the AWTP. The south terminus will be connected to the Mid-City Pipeline Phase 1 project water lines which start on El Cajon Boulevard between 68th and 69th Streets. The project also includes replacement of a remote control panel and antenna mast for the Murray 2nd Pipeline, as well as installation of insert flow meters for the Murray 2nd Pipeline and the Mid-City Pipeline. The majority of the project alignment will be constructed using open trenching. The pipeline will be tunneled and no trenching will be required at three locations: 1) crossing Interstate 8; 2) under the San Diego County Water Authority 108-inch main on Lake Murray Boulevard; and 3) under the San Diego County Water Authority 48-inch main on El Cajon Boulevard. For the I-8 crossing, the tunnel launching pit will be located in the Denny's parking lot at 6970 Alvarado Road on the south side of I-8, and the receiving pit will be on the north side of I-8 in the City of La Mesa within the Lake Murray Boulevard public right-of-way. Both tunneling pits will be sited in existing development areas that do not contain sensitive biological resources.

There will be excavations in unpaved areas at the connection with Valve Vault No. 3 at the AWTP and at the Murray 2nd Pipeline. Existing Valve Vault No. 3 is on City owned land adjacent to Lake Murray Boulevard. The excavation for the Murray 2nd Pipeline is partially within a Multiple Habitat Preservation Area. It is on City owned property near the Del Cerro Baptist Church at the intersection of Pennsylvania Lane and Delaware Avenue. Related work will include traffic control, best management practices for erosion control and storm drain inlet protection, ADA curb ramp installation, pipe abandonment, and resurfacing and restoration of disturbed areas to their original condition. Existing below grade water line will be abandoned along portions of Mohawk Street, 72nd Street, and a public alley north of Mohawk Street.

Applicant: City of San Diego Public Works Department – Engineering and Capital Projects, Architectural Engineering & Parks Division.

I. PROJECT DESCRIPTION: See attached Initial Study.

- II. ENVIRONMENTAL SETTING: See attached Initial Study.
- III. DETERMINATION: The City of San Diego conducted an Initial Study which determined that the proposed project could have a significant environmental affect in the following area(s): **Land Use (MSCP/MHPA Adjacency), Biological Resources, Archaeological Resources and Paleontological Resources.** Subsequent revisions in the project proposal create the specific mitigation identified in Section V of this Mitigated Negative Declaration (MND). The project, as revised, now avoids or mitigates the potentially significant environmental effects previously identified, and the preparation of an Environmental Impact Report will not be required.
- IV. DOCUMENTATION: The attached Initial Study documents the reasons to support the above Determination.
- V. MITIGATION, MONITORING AND REPORTING PROGRAM: To ensure that site development would avoid significant environmental impacts, a Mitigation, Monitoring, and Reporting Program (MMRP) is required. Compliance with the mitigation measures shall be the responsibility of the applicant. The mitigation measures are described below.
- A. GENERAL REQUIREMENTS – PART I**
Plan Check Phase (prior to permit issuance)
1. Prior to the issuance of a Notice To Proceed (NTP) for a subdivision, or any construction permits, such as Demolition, Grading or Building, or beginning any construction related activity on-site, the Development Services Department (DSD) Director’s Environmental Designee (ED) shall review and approve all Construction Documents (CD), (plans, specification, details, etc.) to ensure the MMRP requirements are incorporated into the design.
 2. In addition, the ED shall verify that the MMRP Conditions/Notes that apply ONLY to the construction phases of this project are included VERBATIM, under the heading, **“ENVIRONMENTAL/MITIGATION REQUIREMENTS.”**
 3. These notes must be shown within the first three (3) sheets of the construction documents in the format specified for engineering construction document templates as shown on the City website:
<http://www.sandiego.gov/development-services/industry/standtemp.shtml>
 4. The **TITLE INDEX SHEET** must also show on which pages the “Environmental/Mitigation Requirements” notes are provided.
 5. **SURETY AND COST RECOVERY** – The Development Services Director or City Manager may require appropriate surety instruments or bonds from private Permit Holders to ensure the long term performance or implementation of required mitigation measures or programs. The City is authorized to recover its cost to offset the salary, overhead, and expenses for City personnel and programs to monitor qualifying projects.

B. GENERAL REQUIREMENTS – PART II

Post Plan Check (After permit issuance/Prior to start of construction)

- 1. PRE CONSTRUCTION MEETING IS REQUIRED TEN (10) WORKING DAYS PRIOR TO BEGINNING ANY WORK ON THIS PROJECT.** The PERMIT HOLDER/OWNER is responsible to arrange and perform this meeting by contacting the CITY RESIDENT ENGINEER (RE) of the Field Engineering Division and City staff from MITIGATION MONITORING COORDINATION (MMC). Attendees must also include the Permit holder's Representative(s), Job Site Superintendent and the following consultants:

Qualified Biologist

Qualified Paleontologist

Qualified Archaeologist

Qualified Native American Monitor, Viejas Band of Kumeyaay Indians

Note: Failure of all responsible Permit Holder's representatives and consultants to attend shall require an additional meeting with all parties present.

CONTACT INFORMATION:

- a) The PRIMARY POINT OF CONTACT is the **RE** at the **Field Engineering Division – 858-627-3200**
- b) For Clarification of ENVIRONMENTAL REQUIREMENTS, it is also required to call **RE and MMC at 858-627-3360**

- 2. MMRP COMPLIANCE:** This Project, Project Tracking System (PTS) 406277, shall conform to the mitigation requirements contained in the associated Environmental Document and implemented to the satisfaction of the DSD's Environmental Designee (MMC) and the City Engineer (RE). The requirements may not be reduced or changed but may be annotated (i.e. to explain when and how compliance is being met and location of verifying proof, etc.). Additional clarifying information may also be added to other relevant plan sheets and/or specifications as appropriate (i.e., specific locations, times of monitoring, methodology, etc)

Note: Permit Holder's Representatives must alert RE and MMC if there are any discrepancies in the plans or notes, or any changes due to field conditions. All conflicts must be approved by RE and MMC BEFORE the work is performed.

- 3. OTHER AGENCY REQUIREMENTS:** Evidence of compliance with all other agency requirements or permits shall be submitted to the RE and MMC for review and acceptance prior to the beginning of work or within one week of the Permit Holder obtaining documentation of those permits or requirements. Evidence shall include copies of permits, letters of resolution or other documentation issued by the responsible agency.

City of La Mesa Encroachment Permits

Caltrans Encroachment Permits

- 4. MONITORING EXHIBITS:** All consultants are required to submit, to RE and MMC, a monitoring exhibit on a 11x17 reduction of the appropriate construction plan, such as site plan,

grading, landscape, etc., marked to clearly show the specific areas including the **LIMIT OF WORK**, scope of that discipline’s work, and notes indicating when in the construction schedule that work will be performed. When necessary for clarification, a detailed methodology of how the work will be performed shall be included.

NOTE: Surety and Cost Recovery – When deemed necessary by the Development Services Director or City Manager, additional surety instruments or bonds from the private Permit Holder may be required to ensure the long term performance or implementation of required mitigation measures or programs. The City is authorized to recover its cost to offset the salary, overhead, and expenses for City personnel and programs to monitor qualifying projects.

5. OTHER SUBMITTALS AND INSPECTIONS: The Permit Holder/Owner’s representative shall submit all required documentation, verification letters, and requests for all associated inspections to the RE and MMC for approval per the following schedule:

Document Submittal/Inspection Checklist

<u>Issue Area</u>	<u>Document submittal</u>	<u>Assoc Inspection/Approvals/ Notes</u>
General	Consultant Qualification Letters	Prior to Pre-construction Meeting
General	Consultant Const. Monitoring Exhibits	Prior to or at the Pre-Construction Meeting
Biology	Biology Report	Prior to Construction – Limits of Work (Verification – Project Site)
Archaeology	Archaeology Reports	Archaeology Site Observation
Paleontology	Paleontology Reports	Paleontology Site Observation
Final MMRP		Final MMRP Inspections

C. SPECIFIC MMRP ISSUE AREA CONDITIONS/REQUIREMENTS

BIOLOGICAL RESOURCES

I. Prior to the issuance of a Notice to Proceed (NTP) or any construction permits, including but not limited to, the first Grading Permit, Demolition Plans/Permits and Building Plans/Permits the Development Services Department Deputy Director (DD) environmental designee Mitigation Monitoring Coordination (MMC) shall incorporate the following mitigation measures into the project design and include them verbatim on all appropriate construction documents.

Letters of Qualification Have Been Submitted to DD

1. The applicant shall submit, for approval, a letter verifying the qualifications of the biological professional to MMC. This letter shall identify the Principal Qualified Biologist (PQB) and Qualified Biological Monitor (QBM) and the names of all other persons involved in the implementation of the biological monitoring program, as they are defined in the City of San Diego Biological Review References. Resumes and the biology worksheet should be updated annually.
2. MMC will provide a letter to the applicant confirming the qualifications of the PQB /QBM and all City approved persons involved in the biological monitoring of the project.
3. Prior to the start of work, the applicant must obtain approval from MMC for any personnel changes associated with the biological monitoring of the project.

II. Prior to Start of Construction

A. PQB Shall Attend Preconstruction (Precon) Meetings

1. Prior to beginning any work that requires monitoring:
 - a. The owner/permittee or their authorized representative shall arrange and perform a Precon Meeting that shall include the PQB, Construction Manager (CM) and/or Grading Contractor (GC), Landscape Architect (LA), Revegetation Installation Contractor (RIC), Revegetation Maintenance Contractor (RMC), Resident Engineer (RE), Building Inspector (BI), if appropriate, and MMC.
 - b. The PQB shall also attend any other grading/excavation related Precon Meetings to make comments and/or suggestions concerning the biological monitoring program.
 - c. If the PQB is unable to attend the Precon Meeting, the owner shall schedule a focused Precon Meeting with MMC, PQB, CM, BI, LA, RIC, RMC, RE and/or BI, if appropriate, prior to the start of any work associated with the revegetation/ restoration phase of the project, including site grading preparation.
2. When Biological Monitoring Will Occur
 - a. Prior to the start of any work, the PQB shall also submit a monitoring procedures schedule to MMC and the RE indicating when and where biological monitoring and related activities will occur.
3. PQB Shall Contact MMC to Request Modification
 - a. The PQB may submit a detailed letter to MMC prior to the start of work or during construction requesting a modification to the monitoring program. This request shall be based on relevant information (such as other sensitive species not listed by federal and/or state agencies and/or not covered by the MSCP and to which any impacts may be considered significant under CEQA) which may reduce or increase the potential for biological resources to be present.

III. During Construction

A. PQB or QBM Present During Construction/Grading/Planting

1. The PQB or QBM shall be present full-time during construction activities including but not limited to, site preparation, cleaning, grading, and excavation, in association with the construction of the project which could result in impacts to sensitive biological resources as identified in the LCD and on the RRME. **The QBM is responsible for notifying the PQB of changes to any approved construction plans, procedures, and/or activities. The PQB is responsible to notify MMC of the changes.**
2. The PQB or QBM shall document field activity via the Consultant Site Visit Record Forms (CSVV). The CSVV's shall be faxed by the CM the first day of monitoring, the last day of monitoring, monthly, and in the event that there is a deviation from conditions identified within the LCD and/or biological monitoring program. The RE shall forward copies to MMC.
3. The PQB or QBM shall be responsible for maintaining and submitting the CSVV at the time that CM responsibilities end (i.e., upon the completion of construction activity other than that of associated with biology).
4. All construction activities (including staging areas) shall be restricted to the development areas. The PQB or QBM staff shall monitor construction activities as needed, with MMC concurrence on method and schedule. This is to ensure that construction activities do not encroach into biologically sensitive areas beyond the limits of disturbance.

5. The PQB or QBM shall supervise the placement of orange construction fencing or City approved equivalent, along the limits of potential disturbance adjacent to (or at the edge of) all sensitive habitats.
 6. The PBQ shall provide a letter to MMC that limits of potential disturbance has been surveyed, staked and that the construction fencing is installed properly
 7. The PQB or QBM shall oversee implementation of BMP's, such as gravel bags, straw logs, silt fences or equivalent erosion control measures, as needed to ensure prevention of any significant sediment transport. In addition, the PQB/QBM shall be responsible to verify the removal of all temporary construction BMP's upon completion of construction activities. Removal of temporary construction BMP's shall be verified in writing on the final construction phase CSV.
 8. PQB shall verify in writing on the CSV's that no trash stockpiling or oil dumping, fueling of equipment, storage of hazardous wastes or construction equipment/material, parking or other construction related activities shall occur adjacent to sensitive habitat. These activities shall occur only within the designated staging area located outside the area defined as biological sensitive area.
- B. Disturbance/Discovery Notification Process
1. If unauthorized disturbances occurs or sensitive biological resources are discovered that were not previously identified, the PQB or QBM shall direct the contractor to temporarily divert construction in the area of disturbance or discovery and immediately notify the RE or BI, as appropriate.
 2. The PQB shall also immediately notify MMC by telephone of the disturbance and report the nature and extent of the disturbance and recommend the method of additional protection, such as fencing and appropriate Best Management Practices (BMP's). After obtaining concurrence with MMC and the RE, PQB and CM shall install the approved protection and agreement on BMP's.
 3. The PQB shall also submit written documentation of the disturbance to MMC within 24 hours by fax or email with photos of the resource in context (e.g., show adjacent vegetation).
- C. Determination of Significance
1. The PQB shall evaluate the significance of disturbance and/or discovered biological resource and provide a detailed analysis and recommendation in a letter report with the appropriate photo documentation to MMC to obtain concurrence and formulate a plan of action which can include fines, fees, and supplemental mitigation costs.
 2. MMC shall review this letter report and provide the RE with MMC's recommendations and procedures.

IV. General Bird Mitigation

To avoid any direct impacts to raptors and/or any native/migratory birds, removal of habitat that supports active nests in the proposed area of disturbance should occur outside of the breeding season for these species (February 1 to September 15). If removal of habitat in the proposed area of disturbance must occur during the breeding season, the Qualified Biologist shall conduct a pre-construction survey to determine the presence or absence of nesting birds on the proposed area of disturbance. The pre-construction (precon) survey shall be conducted within 10 calendar days prior to the start of construction activities (including removal of vegetation). The applicant shall submit the results of the precon survey to City DSD for review and approval prior to initiating any construction activities. If nesting birds are detected, a letter report or mitigation plan in conformance with the City's Biology Guidelines and applicable State and Federal Law (i.e. appropriate follow up surveys, monitoring schedules, construction and noise barriers/buffers, etc.) shall be prepared and include

proposed measures to be implemented to ensure that take of birds or eggs or disturbance of breeding activities is avoided. The report or mitigation plan shall be submitted to the City DSD for review and approval and implemented to the satisfaction of the City. The City's MMC Section or RE, and Biologist shall verify and approve that all measures identified in the report or mitigation plan are in place prior to and/or during construction. If nesting birds are not detected during the precon survey, no further mitigation is required.

V. Cooper's Hawk

If work is conducted during the breeding season (February 1 – September 15), a pre-construction survey for Cooper's hawk nests shall be conducted to determine the exact location of a Cooper's hawk nesting site. If a Cooper's hawk nesting site is identified in proximity to the project site/impact area, a 300-foot avoidance area from the Cooper's hawk nest site shall be established and monitored by a qualified biologist to ensure normal Cooper's hawk nest chronology for the subject nest site throughout the project construction activity period. No work may occur within 300 feet of identified Cooper's hawk nests until the young have fledged and the nest is no longer active.

MSCP SUBAREA PLAN -LAND USE ADJACENCY REQUIREMENTS

- I. Prior to issuance of any construction permit or notice to proceed, DSD/ LDR, and/or MSCP staff shall verify the Applicant has accurately represented the project's design in or on the Construction Documents (CD's/CD's consist of Construction Plan Sets for Private Projects and Contract Specifications for Public Projects) are in conformance with the associated discretionary permit conditions and Exhibit "A", and also the City's Multi-Species Conservation Program (MSCP) Multi-Habitat Planning Area (MHPA) Land Use Adjacency Guidelines. The applicant shall provide an implementing plan and include references on/in CD's of the following:
 - A. **Grading/Land Development/MHPA Boundaries** - MHPA boundaries on-site and adjacent properties shall be delineated on the CDs. DSD Planning and/or MSCP staff shall ensure that all grading is included within the development footprint, specifically manufactured slopes, disturbance, and development within or adjacent to the MHPA. For projects within or adjacent to the MHPA, all manufactured slopes associated with site development shall be included within the development footprint.
 - B. **Drainage** - All new and proposed parking lots and developed areas in and adjacent to the MHPA shall be designed so they do not drain directly into the MHPA. All developed and paved areas must prevent the release of toxins, chemicals, petroleum products, exotic plant materials prior to release by incorporating the use of filtration devices, planted swales and/or planted detention/desiltation basins, or other approved permanent methods that are designed to minimize negative impacts, such as excessive water and toxins into the ecosystems of the MHPA.
 - C. **Toxics/Project Staging Areas/Equipment Storage** - Projects that use chemicals or generate by-products such as pesticides, herbicides, and animal waste, and other substances that are potentially toxic or impactive to native habitats/flora/fauna (including water) shall incorporate measures to reduce impacts caused by the application and/or drainage of such materials into the MHPA. No trash, oil, parking, or other construction/development-related material/activities shall be allowed outside any approved construction limits. Where applicable, this requirement shall be incorporated

into leases on publicly-owned property when applications for renewal occur. Provide a note in/on the CD's that states: *"All construction related activity that may have potential for leakage or intrusion shall be monitored by the Qualified Biologist/Owners Representative or Resident Engineer to ensure there is no impact to the MHPA."*

- D. **Lighting** - Lighting within or adjacent to the MHPA shall be directed away/shielded from the MHPA and be subject to City Outdoor Lighting Regulations per LDC Section 142.0740.
- E. **Barriers** - New development within or adjacent to the MHPA shall be required to provide barriers (e.g., non-invasive vegetation; rocks/boulders; 6-foot high, vinyl-coated chain link or equivalent fences/walls; and/or signage) along the MHPA boundaries to direct public access to appropriate locations, reduce domestic animal predation, protect wildlife in the preserve, and provide adequate noise reduction where needed.
- F. **Invasives** - No invasive non-native plant species shall be introduced into areas within or adjacent to the MHPA.
- G. **Brush Management** -New development adjacent to the MHPA shall be set back from the MHPA to provide required Brush Management Zone 1 area on the building pad outside of the MHPA. Zone 2 may be located within the MHPA provided the Zone 2 management will be the responsibility of an HOA or other private entity except here narrow wildlife corridors require it to be located outside of the MHPA. Brush management zones will not be greater in size than currently required by the City's regulations, the amount of woody vegetation clearing shall not exceed 50 percent of the vegetation existing when the initial clearing is done and vegetation clearing shall be prohibited within native coastal sage scrub and chaparral habitats from March 1-August 15 except where the City ADD/MMC has documented the thinning would be consist with the City's MSCP Subarea Plan. Existing and approved projects are subject to current requirements of Municipal Code Section 142.0412.
- H. **Noise** - Due to the site's location adjacent to or within the MHPA where the Qualified Biologist has identified potential nesting habitat for listed avian species, construction noise that exceeds the maximum levels allowed shall be avoided during the breeding seasons for the following: California Gnatcatcher(3/1-8/15). If construction is proposed during the breeding season for the species, U.S. Fish and Wildlife Service protocol surveys shall be required in order to determine species presence/absence. If protocol surveys are not conducted in suitable habitat during the breeding season for the aforementioned listed species, presence shall be assumed with implementation of noise attenuation and biological monitoring.

When applicable (i.e., habitat is occupied or if presence of the covered species is assumed), adequate noise reduction measures shall be incorporated as follows:

COASTAL CALIFORNIA GNATCATCHER (State Species of Special Concern/Federally Threatened)

Prior to the preconstruction meeting, the City Manager (or appointed designee) shall verify that the Multi-Habitat Planning Area (MHPA) boundaries and the following project requirements regarding the coastal California gnatcatcher are shown on the construction plans:

NO MECHANIZED CLEARING, GRUBBING, GRADING, OR OTHER CONSTRUCTION ACTIVITIES SHALL OCCUR BETWEEN MARCH 1 AND AUGUST 15, THE BREEDING SEASON OF THE COASTAL CALIFORNIA GNATCATCHER UNTIL THE FOLLOWING REQUIREMENTS HAVE BEEN MET TO THE SATISFACTION OF THE CITY MANAGER:

- A. A QUALIFIED BIOLOGIST (POSSESSING A VALID ENDANGERED SPECIES ACT SECTION 10(A)(1)(A) RECOVERY PERMIT) SHALL SURVEY THOSE HABITAT AREAS WITHIN THE MHPA THAT WOULD BE SUBJECT TO CONSTRUCTION NOISE LEVELS EXCEEDING 60 DECIBELS [DB(A)] HOURLY AVERAGE FOR THE PRESENCE OF THE COASTAL CALIFORNIA GNATCATCHER. SURVEYS FOR THE COASTAL CALIFORNIA GNATCATCHER SHALL BE CONDUCTED PURSUANT TO THE PROTOCOL SURVEY GUIDELINES ESTABLISHED BY THE U.S. FISH AND WILDLIFE SERVICE WITHIN THE BREEDING SEASON PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION. IF GNATCATCHERS ARE PRESENT, THEN THE FOLLOWING CONDITIONS MUST BE MET:
 - 1. BETWEEN MARCH 1 AND AUGUST 15, NO CONSTRUCTION ACTIVITIES SHALL OCCUR WITHIN ANY PORTION OF THE SITE WHERE CONSTRUCTION ACTIVITIES WOULD RESULT IN NOISE LEVELS EXCEEDING 60 DB(A) HOURLY AVERAGE AT THE EDGE OF OCCUPIED GNATCATCHER HABITAT. AN ANALYSIS SHOWING THAT NOISE GENERATED BY CONSTRUCTION ACTIVITIES WOULD NOT EXCEED 60 DB(A) HOURLY AVERAGE AT THE EDGE OF OCCUPIED HABITAT MUST BE COMPLETED BY A QUALIFIED ACOUSTICIAN (POSSESSING CURRENT NOISE ENGINEER LICENSE OR REGISTRATION WITH MONITORING NOISE LEVEL EXPERIENCE WITH LISTED ANIMAL SPECIES) AND APPROVED BY THE CITY MANAGER AT LEAST TWO WEEKS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES DURING THE BREEDING SEASON, AREAS RESTRICTED FROM SUCH ACTIVITIES SHALL BE STAKED OR FENCED UNDER THE SUPERVISION OF A QUALIFIED BIOLOGIST; OR
 - 2. AT LEAST TWO WEEKS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES, UNDER THE DIRECTION OF A QUALIFIED ACOUSTICIAN, NOISE ATTENUATION MEASURES (E.G., BERMS, WALLS) SHALL BE IMPLEMENTED TO ENSURE THAT NOISE LEVELS RESULTING FROM CONSTRUCTION ACTIVITIES WILL NOT EXCEED 60 DB(A) HOURLY AVERAGE AT THE EDGE OF HABITAT OCCUPIED BY THE COASTAL CALIFORNIA GNATCATCHER. CONCURRENT WITH THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES AND THE CONSTRUCTION OF NECESSARY NOISE ATTENUATION FACILITIES, NOISE MONITORING* SHALL BE CONDUCTED AT THE EDGE OF THE OCCUPIED HABITAT AREA TO ENSURE THAT NOISE LEVELS DO NOT EXCEED 60 DB(A) HOURLY AVERAGE. IF THE NOISE ATTENUATION TECHNIQUES IMPLEMENTED ARE DETERMINED TO BE INADEQUATE BY THE QUALIFIED ACOUSTICIAN OR BIOLOGIST, THEN THE

ASSOCIATED CONSTRUCTION ACTIVITIES SHALL CEASE UNTIL SUCH TIME THAT ADEQUATE NOISE ATTENUATION IS ACHIEVED OR UNTIL THE END OF THE BREEDING SEASON (AUGUST 16).

* Construction noise monitoring shall continue to be monitored at least twice weekly on varying days, or more frequently depending on the construction activity, to verify that noise levels at the edge of occupied habitat are maintained below 60 dB(A) hourly average or to the ambient noise level if it already exceeds 60 dB(A) hourly average. If not, other measures shall be implemented in consultation with the biologist and the City Manager, as necessary, to reduce noise levels to below 60 dB(A) hourly average or to the ambient noise level if it already exceeds 60 dB(A) hourly average. Such measures may include, but are not limited to, limitations on the placement of construction equipment and the simultaneous use of equipment.

- B. IF COASTAL CALIFORNIA GNATCATCHERS ARE NOT DETECTED DURING THE PROTOCOL SURVEY, THE QUALIFIED BIOLOGIST SHALL SUBMIT SUBSTANTIAL EVIDENCE TO THE CITY MANAGER AND APPLICABLE RESOURCE AGENCIES WHICH DEMONSTRATES WHETHER OR NOT MITIGATION MEASURES SUCH AS NOISE WALLS ARE NECESSARY BETWEEN MARCH 1 AND AUGUST 15 AS FOLLOWS:
1. IF THIS EVIDENCE INDICATES THE POTENTIAL IS HIGH FOR COASTAL CALIFORNIA GNATCATCHER TO BE PRESENT BASED ON HISTORICAL RECORDS OR SITE CONDITIONS, THEN THE REQUIREMENTS UNDER SECTION A SHALL BE ADHERED TO AS SPECIFIED ABOVE.
 2. IF THIS EVIDENCE CONCLUDES THAT NO IMPACTS TO THIS SPECIES ARE ANTICIPATED, NO FURTHER MITIGATION MEASURES ARE NECESSARY.

ARCHAEOLOGICAL RESOURCES

I. Prior to Permit Issuance or Bid Opening/Bid Award

A. Entitlements Plan Check

1. Prior to permit issuance or Bid Opening/Bid Award, whichever is applicable, the Assistant Deputy Director (ADD) Environmental designee shall verify that the requirements for Archaeological Monitoring and Native American monitoring have been noted on the applicable construction documents through the plan check process.

B. Letters of Qualification have been submitted to ADD

1. Prior to Bid Award, the applicant shall submit a letter of verification to Mitigation Monitoring Coordination (MMC) identifying the Principal Investigator (PI) for the project and the names of all persons involved in the archaeological monitoring program, as defined in the City of San Diego Historical Resources Guidelines (HRG). If applicable, individuals involved in the archaeological monitoring program must have completed the 40-hour HAZWOPER training with certification documentation.
2. MMC will provide a letter to the applicant confirming the qualifications of the PI and all persons involved in the archaeological monitoring of the project meet the qualifications established in the HRG.
3. Prior to the start of work, the applicant must obtain written approval from MMC for any

personnel changes associated with the monitoring program.

II. Prior to Start of Construction

A. Verification of Records Search

1. The PI shall provide verification to MMC that a site specific records search (1/4 mile radius) has been completed. Verification includes, but is not limited to a copy of a confirmation letter from South Coastal Information Center, or, if the search was in-house, a letter of verification from the PI stating that the search was completed.
2. The letter shall introduce any pertinent information concerning expectations and probabilities of discovery during trenching and/or grading activities.
3. The PI may submit a detailed letter to MMC requesting a reduction to the ¼ mile radius.

B. PI Shall Attend Precon Meetings

1. Prior to beginning any work that requires monitoring; the Applicant shall arrange a Precon Meeting that shall include the PI, Native American consultant/monitor (where Native American resources may be impacted), Construction Manager (CM) and/or Grading Contractor, Resident Engineer (RE), Building Inspector (BI), if appropriate, and MMC. The qualified Archaeologist and Native American Monitor shall attend any grading/excavation related Precon Meetings to make comments and/or suggestions concerning the Archaeological Monitoring program with the Construction Manager and/or Grading Contractor.
 - a. If the PI is unable to attend the Precon Meeting, the Applicant shall schedule a focused Precon Meeting with MMC, the PI, RE, CM or BI, if appropriate, prior to the start of any work that requires monitoring.
2. Acknowledgement of Responsibility for Curation (CIP or Other Public Projects)
The applicant shall submit a letter to MMC acknowledging their responsibility for the cost of curation associated with all phases of the archaeological monitoring program.
3. Identify Areas to be Monitored
 - a. Prior to the start of any work that requires monitoring, the PI shall submit an Archaeological Monitoring Exhibit (AME) (with verification that the AME has been reviewed and approved by the Native American consultant/monitor when Native American resources may be impacted) based on the appropriate construction documents (reduced to 11x17) to MMC identifying the areas to be monitored including the delineation of grading/excavation limits.
 - b. The AME shall be based on the results of a site specific records search as well as information regarding the age of existing pipelines, laterals and associated appurtenances and/or any known soil conditions (native or formation).
 - c. MMC shall notify the PI that the AME has been approved.
4. When Monitoring Will Occur
 - a. Prior to the start of any work, the PI shall also submit a construction schedule to MMC through the RE indicating when and where monitoring will occur.
 - b. The PI may submit a detailed letter to MMC prior to the start of work or during construction requesting a modification to the monitoring program. This request shall be based on relevant information such as review of final construction documents which indicate conditions such as age of existing pipe to be replaced, depth of excavation and/or site graded to bedrock, etc., which may reduce or increase the potential for resources to be present.
5. Approval of AME and Construction Schedule

After approval of the AME by MMC, the PI shall submit to MMC written authorization of the AME and Construction Schedule from the CM.

III. During Construction

A. Monitor Shall be Present During Grading/Excavation/Trenching

1. The Archaeological Monitor shall be present full-time during all soil disturbing and grading/excavation/trenching activities which could result in impacts to archaeological resources as identified on the AME. **The Construction Manager is responsible for notifying the RE, PI, and MMC of changes to any construction activities such as in the case of a potential safety concern within the area being monitored. In certain circumstances OSHA safety requirements may necessitate modification of the AME.**
2. The Native American consultant/monitor shall determine the extent of their presence during soil disturbing and grading/excavation/trenching activities based on the AME and provide that information to the PI and MMC. If prehistoric resources are encountered during the Native American consultant/monitor's absence, work shall stop and the Discovery Notification Process detailed in Section III.B-C and IV.A-D shall commence.
3. The PI may submit a detailed letter to MMC during construction requesting a modification to the monitoring program when a field condition such as modern disturbance post-dating the previous grading/trenching activities, presence of fossil formations, or when native soils are encountered that may reduce or increase the potential for resources to be present.
4. The archaeological and Native American consultant/monitor shall document field activity via the Consultant Site Visit Record (CSV). The CSV's shall be faxed by the CM to the RE the first day of monitoring, the last day of monitoring, monthly (**Notification of Monitoring Completion**), and in the case of ANY discoveries. The RE shall forward copies to MMC.

B. Discovery Notification Process

1. In the event of a discovery, the Archaeological Monitor shall direct the contractor to temporarily divert all soil disturbing activities, including but not limited to digging, trenching, excavating or grading activities in the area of discovery and in the area reasonably suspected to overlay adjacent resources and immediately notify the RE or BI, as appropriate.
2. The Monitor shall immediately notify the PI (unless Monitor is the PI) of the discovery.
3. The PI shall immediately notify MMC by phone of the discovery, and shall also submit written documentation to MMC within 24 hours by fax or email with photos of the resource in context, if possible.
4. No soil shall be exported off-site until a determination can be made regarding the significance of the resource specifically if Native American resources are encountered.

C. Determination of Significance

1. The PI and Native American consultant/monitor, where Native American resources are discovered shall evaluate the significance of the resource. If Human Remains are involved, follow protocol in Section IV below.
 - a. The PI shall immediately notify MMC by phone to discuss significance determination and shall also submit a letter to MMC indicating whether additional mitigation is required.
 - b. If the resource is significant, the PI shall submit an Archaeological Data Recovery Program (ADRP) and obtain written approval of the program from MMC, CM and RE. ADRP and any mitigation must be approved by MMC, RE and/or CM before ground disturbing activities in the area of discovery will be allowed to resume. **Note: If a**

unique archaeological site is also an historical resource as defined in CEQA Section 15064.5, then the limits on the amount(s) that a project applicant may be required to pay to cover mitigation costs as indicated in CEQA Section 21083.2 shall not apply.

- (1). Note: For pipeline trenching and other linear projects in the public Right-of-Way, the PI shall implement the Discovery Process for Pipeline Trenching projects identified below under "D."
- c. If the resource is not significant, the PI shall submit a letter to MMC indicating that artifacts will be collected, curated, and documented in the Final Monitoring Report. The letter shall also indicate that that no further work is required.
 - (1). Note: For Pipeline Trenching and other linear projects in the public Right-of-Way, if the deposit is limited in size, both in length and depth; the information value is limited and is not associated with any other resource; and there are no unique features/artifacts associated with the deposit, the discovery should be considered not significant.
 - (2). Note, for Pipeline Trenching and other linear projects in the public Right-of-Way, if significance cannot be determined, the Final Monitoring Report and Site Record (DPR Form 523A/B) shall identify the discovery as Potentially Significant.
- D. Discovery Process for Significant Resources - Pipeline Trenching and other Linear Projects in the Public Right-of-Way
The following procedure constitutes adequate mitigation of a significant discovery encountered during pipeline trenching activities or for other linear project types within the Public Right-of-Way including but not limited to excavation for jacking pits, receiving pits, laterals, and manholes to reduce impacts to below a level of significance:
 1. Procedures for documentation, curation and reporting
 - a. One hundred percent of the artifacts within the trench alignment and width shall be documented in-situ, to include photographic records, plan view of the trench and profiles of side walls, recovered, photographed after cleaning and analyzed and curated. The remainder of the deposit within the limits of excavation (trench walls) shall be left intact.
 - b. The PI shall prepare a Draft Monitoring Report and submit to MMC via the RE as indicated in Section VI-A.
 - c. The PI shall be responsible for recording (on the appropriate State of California Department of Park and Recreation forms-DPR 523 A/B) the resource(s) encountered during the Archaeological Monitoring Program in accordance with the City's Historical Resources Guidelines. The DPR forms shall be submitted to the South Coastal Information Center for either a Primary Record or SDI Number and included in the Final Monitoring Report.
 - d. The Final Monitoring Report shall include a recommendation for monitoring of any future work in the vicinity of the resource.

IV. Discovery of Human Remains

If human remains are discovered, work shall halt in that area and no soil shall be exported off-site until a determination can be made regarding the provenance of the human remains; and the following procedures as set forth in CEQA Section 15064.5(e), the California Public Resources Code (Sec. 5097.98) and State Health and Safety Code (Sec. 7050.5) shall be undertaken:

A. Notification

1. Archaeological Monitor shall notify the RE or BI as appropriate, MMC, and the PI, if the Monitor is not qualified as a PI. MMC will notify the appropriate Senior Planner in the Environmental Analysis Section (EAS) of the Development Services Department to assist with the discovery notification process.
 2. The PI shall notify the Medical Examiner after consultation with the RE, either in person or via telephone.
- B. Isolate discovery site
1. Work shall be directed away from the location of the discovery and any nearby area reasonably suspected to overlay adjacent human remains until a determination can be made by the Medical Examiner in consultation with the PI concerning the provenience of the remains.
 2. The Medical Examiner, in consultation with the PI, will determine the need for a field examination to determine the provenience.
 3. If a field examination is not warranted, the Medical Examiner will determine with input from the PI, if the remains are or are most likely to be of Native American origin.
- C. If Human Remains **ARE** determined to be Native American
1. The Medical Examiner will notify the Native American Heritage Commission (NAHC) within 24 hours. By law, **ONLY** the Medical Examiner can make this call.
 2. NAHC will immediately identify the person or persons determined to be the Most Likely Descendent (MLD) and provide contact information.
 3. The MLD will contact the PI within 24 hours or sooner after the Medical Examiner has completed coordination, to begin the consultation process in accordance with CEQA Section 15064.5(e), the California Public Resources and Health & Safety Codes.
 4. The MLD will have 48 hours to make recommendations to the property owner or representative, for the treatment or disposition with proper dignity, of the human remains and associated grave goods.
 5. Disposition of Native American Human Remains will be determined between the MLD and the PI, and, if:
 - a. The NAHC is unable to identify the MLD, OR the MLD failed to make a recommendation within 48 hours after being notified by the Commission, OR;
 - b. The landowner or authorized representative rejects the recommendation of the MLD and mediation in accordance with PRC 5097.94 (k) by the NAHC fails to provide measures acceptable to the landowner, THEN
 - c. To protect these sites, the landowner shall do one or more of the following:
 - (1) Record the site with the NAHC;
 - (2) Record an open space or conservation easement; or
 - (3) Record a document with the County.
 - d. Upon the discovery of multiple Native American human remains during a ground disturbing land development activity, the landowner may agree that additional conferral with descendants is necessary to consider culturally appropriate treatment of multiple Native American human remains. Culturally appropriate treatment of such a discovery may be ascertained from review of the site utilizing cultural and archaeological standards. Where the parties are unable to agree on the appropriate treatment measures the human remains and items associated and buried with Native American human remains shall be reinterred with appropriate dignity, pursuant to Section 5.c., above.
- D. If Human Remains are **NOT** Native American
1. The PI shall contact the Medical Examiner and notify them of the historic era context of the burial.

2. The Medical Examiner will determine the appropriate course of action with the PI and City staff (PRC 5097.98).
3. If the remains are of historic origin, they shall be appropriately removed and conveyed to the San Diego Museum of Man for analysis. The decision for internment of the human remains shall be made in consultation with MMC, EAS, the applicant/landowner, any known descendant group, and the San Diego Museum of Man.

V. Night and/or Weekend Work

- A. If night and/or weekend work is included in the contract
 1. When night and/or weekend work is included in the contract package, the extent and timing shall be presented and discussed at the precon meeting.
 2. The following procedures shall be followed.
 - a. No Discoveries
In the event that no discoveries were encountered during night and/or weekend work, the PI shall record the information on the CSVR and submit to MMC via fax by 8AM of the next business day.
 - b. Discoveries
All discoveries shall be processed and documented using the existing procedures detailed in Sections III - During Construction, and IV – Discovery of Human Remains. Discovery of human remains shall always be treated as a significant discovery.
 - c. Potentially Significant Discoveries
If the PI determines that a potentially significant discovery has been made, the procedures detailed under Section III - During Construction and IV-Discovery of Human Remains shall be followed.
 - d. The PI shall immediately contact the RE and MMC, or by 8AM of the next business day to report and discuss the findings as indicated in Section III-B, unless other specific arrangements have been made.
- B. If night and/or weekend work becomes necessary during the course of construction
 1. The Construction Manager shall notify the RE, or BI, as appropriate, a minimum of 24 hours before the work is to begin.
 2. The RE, or BI, as appropriate, shall notify MMC immediately.
- C. All other procedures described above shall apply, as appropriate.

VI. Post Construction

- A. Submittal of Draft Monitoring Report
 1. The PI shall submit two copies of the Draft Monitoring Report (even if negative), prepared in accordance with the Historical Resources Guidelines (Appendix C/D) which describes the results, analysis, and conclusions of all phases of the Archaeological Monitoring Program (with appropriate graphics) to MMC via the RE for review and approval within 90 days following the completion of monitoring. **It should be noted that if the PI is unable to submit the Draft Monitoring Report within the allotted 90-day timeframe as a result of delays with analysis, special study results or other complex issues, a schedule shall be submitted to MMC establishing agreed due dates and the provision for submittal of monthly status reports until this measure can be met.**
 - a. For significant archaeological resources encountered during monitoring, the Archaeological Data Recovery Program or Pipeline Trenching Discovery Process shall be included in the Draft Monitoring Report.
 - b. Recording Sites with State of California Department of Parks and Recreation
The PI shall be responsible for recording (on the appropriate State of California

Department of Park and Recreation forms-DPR 523 A/B) any significant or potentially significant resources encountered during the Archaeological Monitoring Program in accordance with the City's Historical Resources Guidelines, and submittal of such forms to the South Coastal Information Center with the Final Monitoring Report.

2. MMC shall return the Draft Monitoring Report to the PI via the RE for revision or, for preparation of the Final Report.
 3. The PI shall submit revised Draft Monitoring Report to MMC via the RE for approval.
 4. MMC shall provide written verification to the PI of the approved report.
 5. MMC shall notify the RE or BI, as appropriate, of receipt of all Draft Monitoring Report submittals and approvals.
- B. Handling of Artifacts
1. The PI shall be responsible for ensuring that all cultural remains collected are cleaned and catalogued
 2. The PI shall be responsible for ensuring that all artifacts are analyzed to identify function and chronology as they relate to the history of the area; that faunal material is identified as to species; and that specialty studies are completed, as appropriate.
- C. Curation of artifacts: Accession Agreement and Acceptance Verification
1. The PI shall be responsible for ensuring that all artifacts associated with the survey, testing and/or data recovery for this project are permanently curated with an appropriate institution. This shall be completed in consultation with MMC and the Native American representative, as applicable.
 2. When applicable to the situation, the PI shall include written verification from the Native American consultant/monitor indicating that Native American resources were treated in accordance with state law and/or applicable agreements. If the resources were reinterred, verification shall be provided to show what protective measures were taken to ensure no further disturbance occurs in accordance with Section IV – Discovery of Human Remains, Subsection C.
 3. The PI shall submit the Accession Agreement and catalogue record(s) to the RE or BI, as appropriate for donor signature with a copy submitted to MMC.
 4. The RE or BI, as appropriate shall obtain signature on the Accession Agreement and shall return to PI with copy submitted to MMC.
 5. The PI shall include the Acceptance Verification from the curation institution in the Final Monitoring Report submitted to the RE or BI and MMC.
- D. Final Monitoring Report(s)
1. The PI shall submit one copy of the approved Final Monitoring Report to the RE or BI as appropriate, and one copy to MMC (even if negative), within 90 days after notification from MMC of the approved report.
 2. The RE shall, in no case, issue the Notice of Completion until receiving a copy of the approved Final Monitoring Report from MMC which includes the Acceptance Verification from the curation institution.

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PALEONTOLOGICAL RESOURCES

I. Prior to Permit Issuance or Bid Opening/Bid Award

A. Entitlements Plan Check

1. Prior to permit issuance or Bid Opening/Bid Award, whichever is applicable, the Assistant

Deputy Director (ADD) Environmental designee shall verify that the requirements for Paleontological Monitoring have been noted on the appropriate construction documents.

- B. Letters of Qualification have been submitted to ADD
 - 1. Prior to Bid Award, the applicant shall submit a letter of verification to Mitigation Monitoring Coordination (MMC) identifying the Principal Investigator (PI) for the project and the names of all persons involved in the paleontological monitoring program, as defined in the City of San Diego Paleontology Guidelines.
 - 2. MMC will provide a letter to the applicant confirming the qualifications of the PI and all persons involved in the paleontological monitoring of the project.
 - 3. Prior to the start of work, the applicant shall obtain approval from MMC for any personnel changes associated with the monitoring program.

II. Prior to Start of Construction

A. Verification of Records Search

- 1. The PI shall provide verification to MMC that a site specific records search has been completed. Verification includes, but is not limited to a copy of a confirmation letter from San Diego Natural History Museum, other institution or, if the search was in-house, a letter of verification from the PI stating that the search was completed.
- 2. The letter shall introduce any pertinent information concerning expectations and probabilities of discovery during trenching and/or grading activities.

B. PI Shall Attend Precon Meetings

- 1. Prior to beginning any work that requires monitoring, the Applicant shall arrange a Precon Meeting that shall include the PI, Construction Manager (CM) and/or Grading Contractor, Resident Engineer (RE), Building Inspector (BI), if appropriate, and MMC. The qualified paleontologist shall attend any grading/excavation related Precon Meetings to make comments and/or suggestions concerning the Paleontological Monitoring program with the Construction Manager and/or Grading Contractor.
 - a. If the PI is unable to attend the Precon Meeting, the Applicant shall schedule a focused Precon Meeting with MMC, the PI, RE, CM or BI, if appropriate, prior to the start of any work that requires monitoring.
- 2. Acknowledgement of Responsibility for Curation (CIP or Other Public Projects)
The applicant shall submit a letter to MMC acknowledging their responsibility for the cost of curation associated with all phases of the paleontological monitoring program.
- 3. Identify Areas to be Monitored
 - a. Prior to the start of any work that requires monitoring, the PI shall submit a Paleontological Monitoring Exhibit (PME) based on the appropriate construction documents (reduced to 11x17) to MMC for approval identifying the areas to be monitored including the delineation of grading/excavation limits. Monitoring shall begin at depths below 10 feet from existing grade or as determined by the PI in consultation with MMC. The determination shall be based on site specific records search data which supports monitoring at depths less than ten feet.
 - b. The PME shall be based on the results of a site specific records search as well as information regarding existing known soil conditions (native or formation).
 - c. MMC shall notify the PI that the PME has been approved.
- 4. When Monitoring Will Occur
 - a. Prior to the start of any work, the PI shall also submit a construction schedule to MMC through the RE indicating when and where monitoring will occur.

- b. The PI may submit a detailed letter to MMC prior to the start of work or during construction requesting a modification to the monitoring program. This request shall be based on relevant information such as review of final construction documents which indicate conditions such as depth of excavation and/or site graded to bedrock, presence or absence of fossil resources, etc., which may reduce or increase the potential for resources to be present.
5. Approval of PME and Construction Schedule
After approval of the PME by MMC, the PI shall submit to MMC written authorization of the PME and Construction Schedule from the CM.

III. During Construction

A. Monitor Shall be Present During Grading/Excavation/Trenching

1. The monitor shall be present full-time during grading/excavation/trenching activities including, but not limited to mainline, laterals, jacking and receiving pits, services and all other appurtenances associated with underground utilities as identified on the PME that could result in impacts to formations with high and/or moderate resource sensitivity. **The Construction Manager is responsible for notifying the RE, PI, and MMC of changes to any construction activities such as in the case of a potential safety concern within the area being monitored. In certain circumstances OSHA safety requirements may necessitate modification of the PME.**
2. The PI may submit a detailed letter to MMC during construction requesting a modification to the monitoring program when a field condition such as trenching activities that do not encounter formational soils as previously assumed, and/or when unique/unusual fossils are encountered, which may reduce or increase the potential for resources to be present.
3. The monitor shall document field activity via the Consultant Site Visit Record (CSVR). The CSVR's shall be faxed by the CM to the RE the first day of monitoring, the last day of monitoring, monthly (**Notification of Monitoring Completion**), and in the case of ANY discoveries. The RE shall forward copies to MMC.

B. Discovery Notification Process

1. In the event of a discovery, the Paleontological Monitor shall direct the contractor to temporarily divert trenching activities in the area of discovery and immediately notify the RE or BI, as appropriate.
2. The Monitor shall immediately notify the PI (unless Monitor is the PI) of the discovery.
3. The PI shall immediately notify MMC by phone of the discovery, and shall also submit written documentation to MMC within 24 hours by fax or email with photos of the resource in context, if possible.

C. Determination of Significance

1. The PI shall evaluate the significance of the resource.
 - a. The PI shall immediately notify MMC by phone to discuss significance determination and shall also submit a letter to MMC indicating whether additional mitigation is required. The determination of significance for fossil discoveries shall be at the discretion of the PI.
 - b. If the resource is significant, the PI shall submit a Paleontological Recovery Program (PRP) and obtain written approval of the program from MMC, MC and/or RE. PRP and any mitigation must be approved by MMC, RE and/or CM before ground disturbing activities in the area of discovery will be allowed to resume.
 - (1). Note: For pipeline trenching projects only, the PI shall implement the Discovery Process for Pipeline Trenching projects identified below under "D."

- c. If resource is not significant (e.g., small pieces of broken common shell fragments or other scattered common fossils) the PI shall notify the RE, or BI as appropriate, that a non-significant discovery has been made. The Paleontologist shall continue to monitor the area without notification to MMC unless a significant resource is encountered.
 - d. The PI shall submit a letter to MMC indicating that fossil resources will be collected, curated, and documented in the Final Monitoring Report. The letter shall also indicate that no further work is required.
 - (1). Note: For Pipeline Trenching Projects Only. If the fossil discovery is limited in size, both in length and depth; the information value is limited and there are no unique fossil features associated with the discovery area, then the discovery should be considered not significant.
 - (2). Note, for Pipeline Trenching Projects Only: If significance cannot be determined, the Final Monitoring Report and Site Record shall identify the discovery as Potentially Significant.
- D. Discovery Process for Significant Resources - Pipeline Trenching Projects
- The following procedure constitutes adequate mitigation of a significant discovery encountered during pipeline trenching activities including but not limited to excavation for jacking pits, receiving pits, laterals, and manholes to reduce impacts to below a level of significance.
- 1. Procedures for documentation, curation and reporting
 - a. One hundred percent of the fossil resources within the trench alignment and width shall be documented in-situ photographically, drawn in plan view (trench and profiles of side walls), recovered from the trench and photographed after cleaning, then analyzed and curated consistent with Society of Invertebrate Paleontology Standards. The remainder of the deposit within the limits of excavation (trench walls) shall be left intact and so documented.
 - b. The PI shall prepare a Draft Monitoring Report and submit to MMC via the RE as indicated in Section VI-A.
 - c. The PI shall be responsible for recording (on the appropriate forms for the San Diego Natural History Museum) the resource(s) encountered during the Paleontological Monitoring Program in accordance with the City's Paleontological Guidelines. The forms shall be submitted to the San Diego Natural History Museum and included in the Final Monitoring Report.
 - d. The Final Monitoring Report shall include a recommendation for monitoring of any future work in the vicinity of the resource.

IV. Night and/or Weekend Work

- A. If night and/or weekend work is included in the contract
 - 1. When night and/or weekend work is included in the contract package, the extent and timing shall be presented and discussed at the pre-con meeting.
 - 2. The following procedures shall be followed.
 - a. No Discoveries
In the event that no discoveries were encountered during night and/or weekend work, The PI shall record the information on the CSVr and submit to MMC via the RE via fax by 8AM on the next business day.
 - b. Discoveries
All discoveries shall be processed and documented using the existing procedures detailed in Sections III - During Construction.
 - c. Potentially Significant Discoveries

If the PI determines that a potentially significant discovery has been made, the procedures detailed under Section III - During Construction shall be followed.

- d. The PI shall immediately contact the RE and MMC, or by 8AM on the next business day to report and discuss the findings as indicated in Section III-B, unless other specific arrangements have been made.
- B. If night and/or weekend work becomes necessary during the course of construction
 1. The Construction Manager shall notify the RE, or BI, as appropriate, a minimum of 24 hours before the work is to begin.
 2. The RE, or BI, as appropriate, shall notify MMC immediately.
- C. All other procedures described above shall apply, as appropriate.

V. Post Construction

- A. Preparation and Submittal of Draft Monitoring Report
 1. The PI shall submit two copies of the Draft Monitoring Report (even if negative), prepared in accordance with the Paleontological Guidelines which describes the results, analysis, and conclusions of all phases of the Paleontological Monitoring Program (with appropriate graphics) to MMC via the RE for review and approval within 90 days following the completion of monitoring,
 - a. For significant paleontological resources encountered during monitoring, the Paleontological Recovery Program or Pipeline Trenching Discovery Process shall be included in the Draft Monitoring Report.
 - b. Recording Sites with the San Diego Natural History Museum
The PI shall be responsible for recording (on the appropriate forms) any significant or potentially significant fossil resources encountered during the Paleontological Monitoring Program in accordance with the City's Paleontological Guidelines, and submittal of such forms to the San Diego Natural History Museum with the Final Monitoring Report.
 2. MMC shall return the Draft Monitoring Report to the PI via the RE for revision or, for preparation of the Final Report.
 3. The PI shall submit revised Draft Monitoring Report to MMC via the RE for approval.
 4. MMC shall provide written verification to the PI of the approved report.
 5. MMC shall notify the RE or BI, as appropriate, of receipt of all Draft Monitoring Report submittals and approvals.
- B. Handling of Fossil Remains
 1. The PI shall be responsible for ensuring that all fossil remains collected are cleaned and catalogued.
- C. Curation of artifacts: Deed of Gift and Acceptance Verification
 1. The PI shall be responsible for ensuring that all fossil remains associated with the monitoring for this project are permanently curated with an appropriate institution.
 2. The PI shall submit the Deed of Gift and catalogue record(s) to the RE or BI, as appropriate for donor signature with a copy submitted to MMC.
 3. The RE or BI, as appropriate shall obtain signature on the Deed of Gift and shall return to PI with copy submitted to MMC.
 4. The PI shall include the Acceptance Verification from the curation institution in the Final Monitoring Report submitted to the RE or BI and MMC.
- D. Final Monitoring Report(s)
 1. The PI shall submit two copies of the Final Monitoring Report to MMC (even if negative), within 90 days after notification from MMC of the approved report.

2. The RE shall, in no case, issue the Notice of Completion until receiving a copy of the approved Final Monitoring Report from MMC which includes the Acceptance Verification from the curation institution.

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VI. PUBLIC REVIEW DISTRIBUTION:

Draft copies or notice of this Mitigated Negative Declaration were distributed to:

US Government
US Fish & Wildlife Service

State of California
California Dept. of Fish & Wildlife

County of San Diego
Dept. of Environmental Health

City of La Mesa

City of San Diego
Councilmember Sherman - District 7
Councilmember Emerald – District 9
Mayor’s Office
City Attorney’s Office
Shannon Thomas
Facilities Financing
Tom Tomlinson
Water Review
Mehdi Rastakhiz
Development Services
Mark Brunette
Peter Kann
Engineering and Capital Projects
Alice Altes
James Arnhart
Library Dept. – Government Projects
San Carlos Branch Library
College – Rolando Branch Library

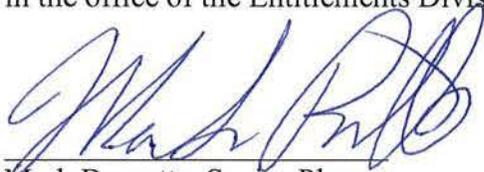
Other Groups and Individuals
Navajo Community Planners Inc.
San Carlos Area Council
San Diego Natural History Museum
Historical Resources Board
South Coastal Information Center
San Diego History Center

San Diego Archaeological Center
Save Our Heritage Organisation
San Diego County Archaeological Society, Inc.
Ron Christman
Clint Linton
Frank Brown – Inter-Tribal Cultural Resources Council
Campo Band of Mission Indians
Native American Heritage Commission
Kumeyaay Cultural Heritage Preservation
Kumeyaay Cultural Repatriation Committee
Native American Distribution
Sierra Club
San Diego Audubon Society
Mr. Jim Peugh
California Native Plant Society
Endangered Habitats League

VII. RESULTS OF PUBLIC REVIEW:

- () No comments were received during the public input period.
- (X) Comments were received but did not address the draft Mitigated Negative Declaration finding or the accuracy/completeness of the Initial Study. No response is necessary. The letters are attached.
- () Comments addressing the findings of the draft Negative Declaration and/or accuracy or completeness of the Initial Study were received during the public input period. The letters and responses follow.

Copies of the draft Mitigated Negative Declaration, and any Initial Study material are available in the office of the Entitlements Division for review, or for purchase at the cost of reproduction.



Mark Brunette, Senior Planner
Development Services Department

November 6, 2015

Date of Draft Report

December 10, 2015

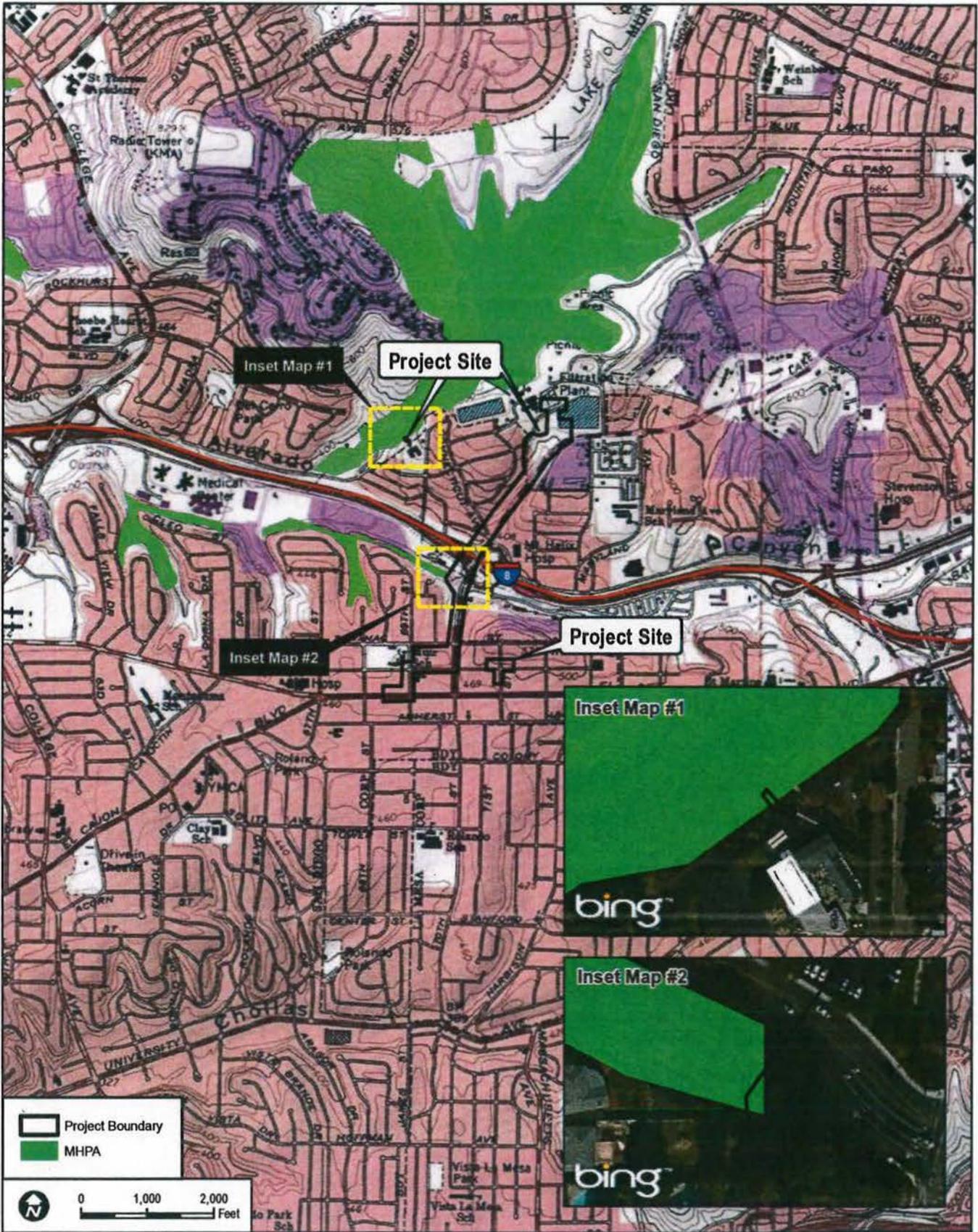
Date of Final Report

Analyst: Mark Brunette

Attachments: Figures 1 & 2
 Location Map
 Initial Study Checklist



<p>DUDEK</p>	<p>FIGURE 1 Regional Map</p>
<p>7643-06</p>	<p>MID-CITY PIPELINE PHASE II - BIOLOGICAL RESOURCES LETTER REPORT</p>



DUDEK
7643-06

SOURCE: USGS 7.5-Minute Series La Mesa Quadrangle; SANGIS 2003

MID-CITY PIPELINE PHASE II - BIOLOGICAL RESOURCES LETTER REPORT

FIGURE 2
Vicinity Map

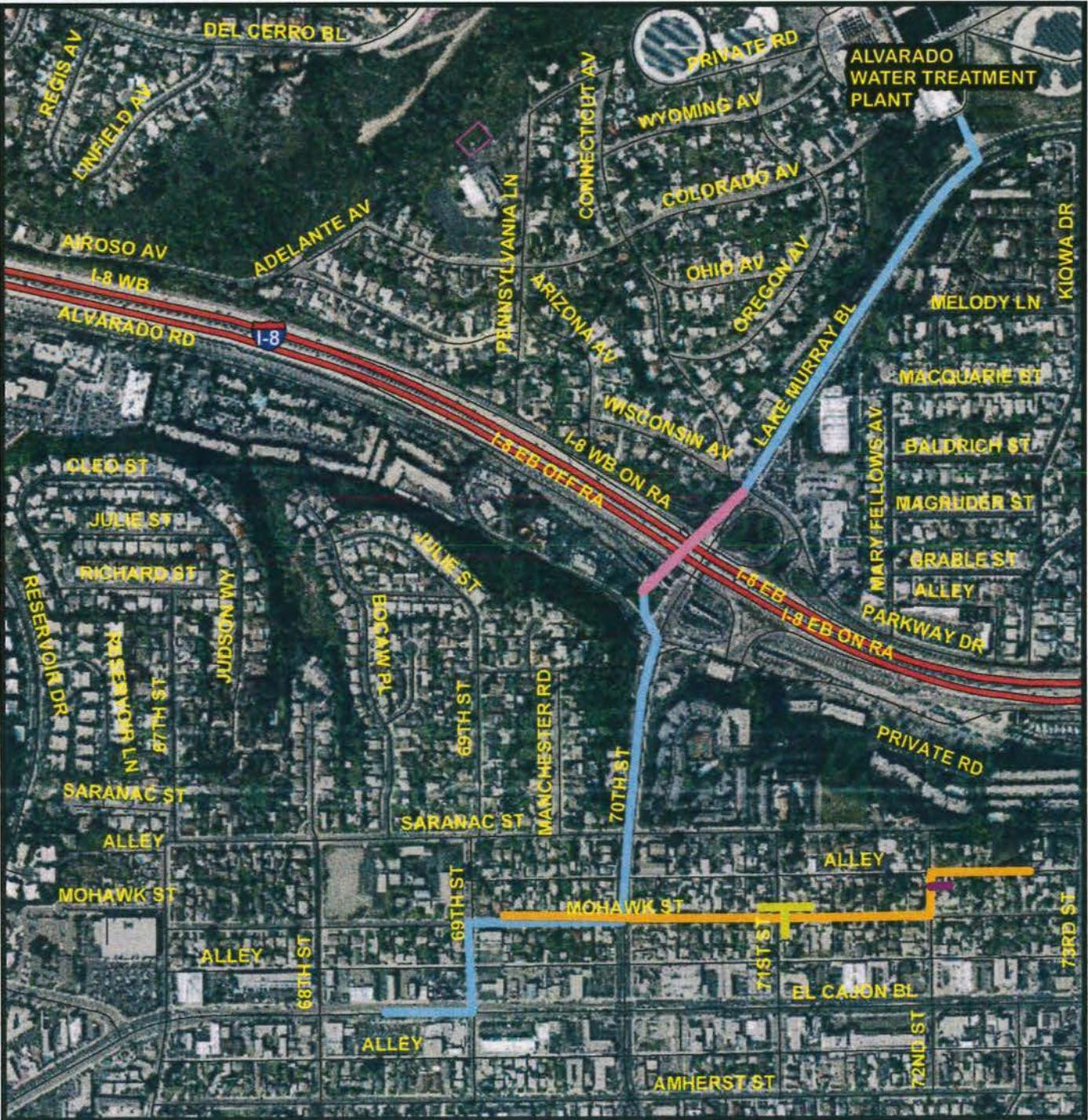
MID-CITY PIPELINE PROJECT - PHASE II

SENIOR ENGINEER
 IRAJ ASGHARZADEH, P.E.
 619-533-5104

PROJECT MANAGER
 ALICE ALTES, P.E.
 619-533-4105

PROJECT ENGINEER
 MICHELLE GARCIA-QUILICO
 619-533-8635

CONSTRUCTION PROJECT
 INFORMATION LINE
 619-533-4207



Legend

- Service Transfer
- 8 inch Main
- Tunnel Crossing
- Mid-City Pipeline Phase 2
- Abandonment



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INITIAL STUDY CHECKLIST

1. Project Title/Project Number:

MONTEZUMA PIPELINE/MID-CITY PIPELINE PHASE 2

2. Lead agency name and address:

City of San Diego
Department of Development Services
1222 First Avenue, MS 501
San Diego, CA 92101

3. Contact person and phone number:

Mark Brunette/ (619) 446-5379

4. Project location:

The Project is located in eastern and mid-city San Diego (Figure 1) along Lake Murray Boulevard/70th Street and neighboring side streets in portions of the College Area and Navajo communities (Figure 2). Portions of the Project along Lake Murray Boulevard at Interstate 8 (I-8) lie within the municipal boundaries of the City of La Mesa. The Project's southern terminus is at El Cajon Boulevard and 68th Street in the City of San Diego, California; the northern terminus is within the grounds of the Alvarado Water Treatment Plant along Lake Murray Boulevard (Figure 2).

5. Project Applicant/Sponsor's name and address:

City of San Diego Public Works Department – Engineering and Capital Projects, Architectural Engineering & Parks Division, 600 B Street / MS 908, San Diego, CA 92101-4502

6. General Plan designation:

City of San Diego Public Right-of-Way (PROW) land is not a designated land use in the General Plan. However, right-of-way is categorized as Road/Freeways/ Transportation in the General Plan. The Pacific Beach Reservoir site is designated Residential in the General Plan and Single Family Residential in the Pacific Beach Community Plan.

7. Zoning:

The project would take place within various public rights-of-way and public easements within developed areas of the Pacific Beach, Mission Bay Park, Midway-Pacific Highway, Peninsula and Linda Vista Community Planning Areas in the City of San Diego. Adjacent zoning may include, but is not limited to, Open Space, Residential, Commercial, Institutional, and Industrial. The Pacific Beach Reservoir property is within the RS-1-4 (Single Family Residential) zone.

8. Description of project (Describe the whole action involved, including but not limited to, later phases of the project, and any secondary, support, or off-site features necessary for its implementation.):

The Montezuma/Mid-City Pipeline Phase II project is the second and final phase, of a larger project that provides a parallel and redundant water pipeline to the City of San Diego's existing 54" Trojan Water Transmission Pipeline. The Montezuma/Mid-City Pipeline is needed to enhance water service and reliability for the Mid-City areas, which include the communities of City Heights, College Area, Darnall, El Cerrito, Kensington, North Park, Normal Heights, Oak Park, Redwood Village, Rolando, Talmadge, and University Heights. The first phase of the project was completed in 2002 and is currently in service. Phase 1 included 4.5 miles of 48" diameter cement mortar lined and coated (CML&C) steel water transmission main, which generally runs along El Cajon Boulevard starting on Highland Drive and ending at the San Diego County Water Authority (SDCWA)/City of San Diego Flow Control Facility (FCF) 18/21. FCF 18/21 is located between 68th Street and 69th Street on El Cajon Boulevard.

A SITE DEVELOPMENT PERMIT for encroachment into Environmentally Sensitive Lands is required for Phase II of the project. Phase II would install approximately 1.16 miles of new water pipelines, consisting of 5,680 linear feet (LF) of new 66" diameter Cement Lined and Coated Steel transmission main and 422 LF of 8-inch PVC distribution main. The 66-inch transmission main will run from the Alvarado Water Treatment Plant (AWTP), located at the intersection of Lake Murray Boulevard and Kiowa Drive, to the intersection of 68th and El Cajon Boulevard. The northern terminus of the pipeline will be connected to Existing Valve Vault No. 3 located where the Earl Thomas Reservoir Outlet Pipeline intersects the Clear Wells Interconnect Pipeline at the AWTP. The south terminus will be connected to the Mid-City Pipeline Phase 1 project water lines which start on El Cajon Boulevard between 68th and 69th Streets. The project also includes replacement of a remote control panel and 34-foot tall antenna mast for the Murray 2nd Pipeline, as well as installation of insert flow meters for the Murray 2nd Pipeline and the Mid-City Pipeline.

The majority of the project alignment will be constructed using open trenching. The pipeline will be tunneled and no trenching will be required at three locations: 1) crossing Interstate 8; 2) under the San Diego County Water Authority 108-inch main on Lake Murray Boulevard; and 3) under the San Diego County Water Authority 48-inch main on El Cajon Boulevard. For the I-8 crossing, the tunnel launching pit will be located in the Denny's parking lot at 6970 Alvarado Road on the south side of I-8, and the receiving pit will be on the north side of I-8 in the City of La Mesa within the Lake Murray Boulevard public right-of-way. Both tunneling pits will be sited in existing development areas that do not contain sensitive biological resources.

There will be excavations in unpaved areas at the connection with Valve Vault No. 3 at the AWTP and at the Murray 2nd Pipeline. Existing Valve Vault No. 3 is on City owned land adjacent to Lake Murray Boulevard. The excavation for the Murray 2nd Pipeline is partially within a Multiple Habitat Preservation Area. It is on City owned property near the Del Cerro Baptist Church at the intersection of Pennsylvania Lane and Delaware Avenue. Related work will include traffic control, best management practices for erosion control and storm drain inlet

protection, ADA curb ramp installation, pipe abandonment, and resurfacing and restoration of disturbed areas to their original condition. Existing below grade water line will be abandoned along portions of Mohawk Street, 72nd Street, and a public alley north of Mohawk Street.

Equipment and pipeline staging areas would be located within existing roadway paved areas and parking lots adjacent to the roadways. An office trailer is expected to be used by the construction contractor. The trailer is expected to be located on City property at the Earl Thomas Reservoir near the Alvarado Water Treatment Plant.

Surrounding land uses and setting: Briefly describe the project's surroundings:

Elevations in the study area range from 472 feet above mean sea level (AMSL) near the southern extent of the Project to 513 AMSL near the northern terminus of the Project at the Alvarado Water Treatment Plant (AWTP). Surrounding land uses are best described as developed with mixed use development supported by single- and multi-family residential uses, commercial, and communication utilities for the AWTP. South of I-8, the topography increases in elevation as the Project heads south into the College Area, where single-family neighborhoods lie on a flat plateau overlooking I-8. The Project area also supports a school, multi-family residential uses, and commercial developments along 68th Street to El Cajon Boulevard.

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement):
 1. City of La Mesa Encroachment Permit for any work in La Mesa right-of-way or public easements.
 2. City of La Mesa Encroachment Agreement for any type of private improvements encroaching into the public right-of-way or public easement.
 3. Dept. of Occupational Safety and Health (DOSH) for construction of trenches or excavation which are five feet or deeper and into which a person is required to descend.
 4. Transportation permits for unusually wide and heavy loads.
 5. Caltrans discretionary review and approval, and an Encroachment Permit for any work in Caltrans right-of-way or public easements.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

- | | | |
|---|--|---|
| <input type="checkbox"/> Aesthetics | <input type="checkbox"/> Greenhouse Gas Emissions | <input type="checkbox"/> Population/Housing |
| <input type="checkbox"/> Agriculture and Forestry Resources | <input type="checkbox"/> Hazards & Hazardous Materials | <input type="checkbox"/> Public Services |
| <input type="checkbox"/> Air Quality | <input type="checkbox"/> Hydrology/Water Quality | <input type="checkbox"/> Recreation |
| <input checked="" type="checkbox"/> Biological Resources | <input checked="" type="checkbox"/> Land Use/Planning | <input type="checkbox"/> Transportation/Traffic |
| <input checked="" type="checkbox"/> Cultural Resources | <input type="checkbox"/> Mineral Resources | <input type="checkbox"/> Utilities/Service System |
| <input type="checkbox"/> Geology/Soils | <input type="checkbox"/> Noise | <input checked="" type="checkbox"/> Mandatory Findings Significance |

DETERMINATION: (To be completed by Lead Agency)

On the basis of this initial evaluation:

- The proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
- Although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
- The proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
- The proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (a) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (b) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required.

- Although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or (MITIGATED) NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or (MITIGATED) NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

EVALUATION OF ENVIRONMENTAL IMPACTS:

- 1) A brief explanation is required for all answers except “No Impact” answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A “No Impact” answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A “No Impact” answer should be explained where it is based on project specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis.)
- 2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
- 3) Once the lead agency has determined that a particular physical impact may occur, the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. “Potentially Significant Impact” is appropriate if there is substantial evidence that an effect may be significant. If there are one or more “Potentially Significant Impact” entries when the determination is made, an EIR is required.
- 4) “Negative Declaration: Less Than Significant With Mitigation Incorporated” applies where the incorporation of mitigation measures has reduced an effect from “Potentially Significant Impact” to a “Less Than Significant Impact.” The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from “Earlier Analyses”, as described in (5) below, may be cross-referenced).
- 5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or (mitigated) negative declaration. *Section 15063(c)(3)(D)*. In this case, a brief discussion should identify the following:
 - a. Earlier Analysis Used. Identify and state where they are available for review.

- b. Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
 - c. Mitigation Measures. For effects that are "Less Than Significant With Mitigation Measures Incorporated", describe the mitigation measures that were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.
- 6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.
- 7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion. Please note, all reports and documents mentioned in this document are available for public review in the Entitlements Division on the Fifth Floor of 1222 First Avenue, San Diego.
- 8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.
- 9) The explanation of each issue should identify:
- a. The significance criteria or threshold, if any, used to evaluate each question; and
 - b. The mitigation measure identified, if any, to reduce the impact to less than significant.

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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I) AESTHETICS – Would the project:

- a) Have a substantial adverse effect on a scenic vista?

All of the proposed work would occur either below grade or under existing bridges where existing pipeline would be replaced or repaired so no new visual impacts occur as a result of the project. In addition, it is not anticipated that the project would remove or replace trees or street lights. Therefore, the proposed project would have no significant impacts to public scenic vistas and no mitigation would be required.

- b) Substantially damage scenic resources, including but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

See answer to I.a. above. In addition, the project would not damage any existing scenic trees, rock outcroppings, or historic buildings (Refer to V.a.) as none of these features are located within the boundaries of the proposed project.

- c) Substantially degrade the existing visual character or quality of the site and its surroundings?

See answer to I.b. above.

- d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?

The project does not include any new or modified light sources such as new or replacement street lights, and the project would not utilize highly reflective materials. In addition, no substantial sources of light would be generated during project construction, as construction activities would occur during daylight hours. The project would also be subject to the City's Outdoor Lighting Regulations per Municipal Code Section 142.0740.

II) AGRICULTURAL AND FOREST RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. – Would the project:

- | | | | | |
|---|--------------------------|--------------------------|--------------------------|-------------------------------------|
| a) Converts Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|---|--------------------------|--------------------------|--------------------------|-------------------------------------|

The project would occur within existing improved PROW or sewer or water easements which are not designated for agricultural use or farmland. In addition, agricultural land is not present in the vicinity of the project.

- | | | | | |
|--|--------------------------|--------------------------|--------------------------|-------------------------------------|
| b) Conflict with existing zoning for agricultural use, or a Williamson Act Contract? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|--|--------------------------|--------------------------|--------------------------|-------------------------------------|

Refer to II.a.

- | | | | | |
|---|--------------------------|--------------------------|--------------------------|-------------------------------------|
| c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 1220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|---|--------------------------|--------------------------|--------------------------|-------------------------------------|

The project would occur in an urbanized area of San Diego within existing improved PROW or sewer or water easements which are not designated as forest land. In addition, forest land land is not present in the vicinity of the project.

- | | | | | |
|--|--------------------------|--------------------------|--------------------------|-------------------------------------|
| d) Result in the loss of forest land or conversion of forest land to non-forest use? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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Refer to II.c.

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|--|--------------------------|--------------------------|--------------------------|-------------------------------------|
| e) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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The project does not propose a change in land use and would not result in the conversion of Farmland since no Farmland exists within, or in the vicinity, of the project boundaries.

III. AIR QUALITY – Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied on to make the following determinations - Would the project:

- a) Conflict with or obstruct implementation of the applicable air quality plan?

The proposed sewer and water main replacement would not involve any future actions that would generate air quality emissions as a result of the proposed use (e.g. vehicle miles traveled). However, emissions would occur during the construction phase of the project and could increase the amount of harmful pollutants entering the air basin. The emissions would be minimal and would only occur temporarily during construction. Additionally, the construction equipment typically involved in water/sewer project is small-scale and generates relatively few emissions. When appropriate, dust suppression methods would be included as project components. As such, the project would not conflict with the region’s air quality plan.

- b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

Refer to III.b

- c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

As described above, construction operations could temporarily increase the emissions of dust and other pollutants. However, construction emissions would be temporary and implementation of Best Management Practices would reduce potential impacts related to construction activities to below a level of significance. Therefore, the project would not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under applicable federal or state ambient air quality standards.

- d) Expose sensitive receptors to substantial

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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pollutant concentrations?

Construction operations could temporarily increase the emissions of harmful pollutants, which could affect sensitive receptors adjacent to the project. However, construction emissions would be temporary and it is anticipated that implementation of construction BMPs would reduce potential impacts related to construction activities to minimal levels. Therefore, the project would not expose sensitive receptors to substantial pollutant concentrations.

- e) Create objectionable odors affecting a substantial number of people?

Operation of construction equipment and vehicles could generate odors associated with fuel combustion. However, these odors would dissipate into the atmosphere upon release and would only remain temporarily in proximity to the construction equipment and vehicles. Therefore, the project would not create odors affecting a substantial number of people

IV. BIOLOGICAL RESOURCES – Would the project:

- a) Have substantial adverse effects, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

A Biological Letter Report for the Pacific Beach Pipeline Project was prepared by Tierra Data Inc. (August 22, 2014). The letter report analyzed the impacts of the proposed project on the biological resources located in the vicinity of the Pacific Beach Reservoir and the North Ingraham, South Ingraham and West Mission Bay Drive bridges. The remainder of the pipeline project occurs within improved public right-of-way and previously disturbed sewer and water easements which do not contain sensitive biological resources. The Biological Letter Report concluded the project would not result in significant, direct, indirect, or cumulative impacts to sensitive or regulated biological resources at the three affected bridges or reservoir site, and no mitigation is necessary for the project beyond standard Best Management Practices.

- b) Have a substantial adverse effect on any riparian habitat or other community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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Refer to IV.a.

- c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Refer to IV.a. According to the project's biological letter report the project would not result in any impacts to wetlands or waters of the US near the site due to the use of standard Best Management Practices during project construction.

- d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

According to the project's biological letter report, Mission Bay is not a designated as a wildlife corridor and it does not restrict the movement of animals between habitats. The reservoir site is an isolated patch of habitat in an urbanized area that does not act as a wildlife corridor. As such, the project does not occur in designated wildlife corridors and, therefore, will not substantially interfere with wildlife movement.

- e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Refer to IV.a. The project would comply with all local policies and ordinances protecting biological resources including satisfying mitigation requirements for impacts to sensitive biological resources in accordance with the City of San Diego Multiple Species Conservation Program and the City of San Diego Biology Guidelines. Furthermore, the site is not in or adjacent to an MHPA nor does it contain trees subject to a tree preservation policy.

- f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Refer to IV.a and IV.e. The site is not within or adjacent to an MHPA. The project would not conflict with any local conservation plans.

- V. CULTURAL RESOURCES – Would the project:
 - a) Cause a substantial adverse change in the

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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significance of an historical resource as defined in §15064.5?

The only potential historical resource that could be affected by the project is the abandoned Pacific Beach Reservoir. However, a Historical Resource Technical Report for the Pacific Beach Pipeline Project (Rincon Consultants, January 6, 2014) recommended that, based on the results of a records search, archival research, and a site visit, the Pacific Beach Reservoir is ineligible for listing in the California Historical Register of Historical Resources (CRHR). The Historical Report was reviewed by qualified City of San Diego Historic Review staff who concurred with the report's recommendation.

- b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

The Pacific Beach Pipeline Project may include excavation of previously undisturbed native surficial soil, which has the potential to contain sensitive archaeological resources. Therefore, the project could result in a significant environmental impact on archaeological resources.

To reduce potential impacts to archaeological resources to below a level of significance, excavation within previously undisturbed soil, for either new trench alignments and/or for replacement of pipelines within the same trench alignment occurring at a deeper depth than the previously existing pipeline, would be monitored by a qualified archaeologist or archaeological monitor. Any significant archaeological resources that are encountered would be recovered and curated in accordance with the mitigation monitoring and Reporting Program (MMRP) detailed in Section V.

- c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

The portion of the Pacific Beach Pipeline project that is north of the North Ingraham Street bridge could involve excavation depths greater than 10 feet in the Linda Vista Formation (moderate sensitivity rating for discovery of paleontological resources), and the Bay Point and San Diego formations (high sensitivity rating). Therefore, the project could result in potentially significant impacts to fossil resources.

To reduce potential impacts on paleontological resources to below a level of significance, excavation within previously undisturbed formations at a depth of 10 or more feet, for either new trench alignments and/or for replacement of pipelines within the same trench alignment occurring at a deeper depth than the previously existing

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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pipeline, would be monitored by a qualified paleontologist or paleontological monitor. Any significant paleontological resources encountered would be recovered and curated in accordance with the mitigation monitoring and Reporting Program (MMRP) detailed in Section V.

- d) Disturb any human remains, including those interred outside of formal cemeteries?

No cemeteries, formal or informal, have been identified on or adjacent to the project site. While there is a possibility of encountering human remains during subsequent project construction activities, if remains are found monitoring would be required. In addition, per CEQA Section 15064.5(e), the California Public Resources Code (Sec. 5097.98) and State Health and Safety Code (Sec. 7050.5), if human remains are discovered during construction, work would be required to halt in that area and no soil would be exported off-site until a determination could be made regarding the provenance of the human remains via the County Coroner and other authorities as required.

VI. GEOLOGY AND SOILS – Would the project:

- a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
- i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

The project would utilize proper engineering design and standard construction practices in order to ensure that potential impacts in this category based on regional geologic hazards would remain less than significant. Therefore risks from rupture of a known earthquake fault would be below a level of significance.

- ii) Strong seismic ground shaking?

See VI.a.i above. The project would be required to utilize proper engineering design and standard construction practices to ensure that the potential for impacts from ground shaking would be below a level of significance.

- iii) Seismic-related ground failure, including liquefaction?

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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See VI.a and b above.

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| iv) Landslides? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
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See VI.a and b above.

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| b) Result in substantial soil erosion or the loss of topsoil? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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Refer to VI.a. In addition, the majority of the project would occur within the improved public right of way. Any disturbances to paved alleys and streets would be backfilled and resurfaced in kind. Excavation of the abandoned Pacific Beach Reservoir would be backfilled, graded and the entire site would be revegetated, which would preclude soil erosion or topsoil loss. Additionally, appropriate Best Management Practices would be utilized during project construction to prevent soil erosion. As such, the project would not result in a substantial amount of soil erosion or loss of topsoil.

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| c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
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The project is located within various Geologic Hazard Categories. However, proper engineering design and utilization of standard construction practices would ensure that the potential impacts would be less than significant.

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| d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|--|--------------------------|--------------------------|-------------------------------------|--------------------------|

Refer to VI.a.

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|--|--------------------------|--------------------------|--------------------------|-------------------------------------|
| e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|--|--------------------------|--------------------------|--------------------------|-------------------------------------|

Refer to VI.a. In addition, no septic or alternative wastewater systems are proposed since the scope of the project is to repair and replace existing public sewer and water mains.

VII. GREENHOUSE GAS EMISSIONS – Would the project:

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|---|--------------------------|--------------------------|-------------------------------------|--------------------------|
| a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
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Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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The City is utilizing data from the California Air Pollution Control Officers Association (CAPCOA) report "CEQA & Climate Change" dated January 2008 as an interim significance threshold to determine whether there is a potential for significant Greenhouse Gas (GHG) impacts and a GHG analysis will be required. The CAPCOA report references a 900 metric ton guideline as a conservative threshold for requiring further analysis and possible mitigation. This emission level is based on the amount of vehicle trips, the typical energy and water use associated with projects, and other factors.

CAPCOA identifies project types that are estimated to emit approximately 900 metric tons of GHG's annually. This 900 metric ton threshold is roughly equivalent to 35000 square feet of office space, 11,000 square feet of retail, 50 single family residential units, 70 multi-family residential units and 6,300 square-foot supermarkets.

Since the proposed sewer and water main repair project does not fit in the categories listed above, a GHG modeling analysis was conducted to determine the level of GHG emissions. The Roadway Construction Emission Model is a spreadsheet program created by the Sacramento Metropolitan Air Quality Management District to analyze construction related GHGs and was utilized to quantify the project's GHG emissions. The model utilizes project information (e.g. total construction months, project type, construction equipment, grading quantities and the total disturbance area, etc.) to quantify GHG emissions from heavy-duty construction equipment, haul trucks and worker commute trips associated with linear construction projects.

Results of the Roadway Construction Emissions Model output demonstrated that during the 14 months of construction the project would generated approximately 600 metric tons per year. The output for the project falls well below the 900 metric ton per year figure. Therefore, based on the aforementioned GHG analysis, the project would result in a less than significant CEQA Greenhouse Gas impact and mitigation would not be required.

- b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

The project as proposed would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing greenhouse gas emission in that it would be constructed in an established urban area with services and facilities available. In addition, the project is consistent with the General Plan.

VIII. HAZARDS AND HAZARDOUS MATERIALS –

- Would the project:
 - a) Create a significant hazard to the public or the

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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environment through routine transport, use, or disposal of hazardous materials?

Construction of the project may require the use of hazardous materials (e.g. fuels, lubricants, solvents, etc.) which would require proper storage, handling, use and disposal; however, these conditions would not occur during routine construction within the PROW. Construction specifications would include requirements for the contractor regarding where routine handling or disposal of hazardous materials could occur and what measures to implement in the event of a spill from equipment. Compliance with contract specifications would ensure that potential hazards are minimized to below a level of significance.

- b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

Construction of the project may have the potential to traverse properties which could contain Leaking Underground Storage Tank (LUST) cleanup sites, permitted UST's, or contaminated sites located within 1,000 feet of the project alignments; however, in the event that construction activities encounter underground contamination, the contractor would be required to implement section 803 of the City's "WHITEBOOK" for "Encountering or Releasing Hazardous Substances or Petroleum Products" of the City of San Diego Standard Specifications for Public Works Construction which is included in all construction documents and would ensure the proper handling and disposal of any contaminated soils in accordance with all applicable local, state, and federal regulations. Compliance with these requirements would minimize the risk to the public and the environment; therefore, impacts would remain less than significant.

- c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

Portions of the project alignment are within one-quarter mile of existing schools and would involve trenching or excavation activities that could result in the release of hazardous emissions if unanticipated contamination is encountered within the PROW. However, section 803 of the City's "WHITEBOOK" to ensure that appropriate protocols are followed pursuant to County DEH requirements should any hazardous conditions be encountered. As such, impacts regarding the handling or discovery of hazardous materials, substances or waste within close proximity of a school would be below a level of significance with implementation of the measures required pursuant to the contract specifications and County DEH oversight.

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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- d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?
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| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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See VIIIa-c above. In addition, the project alignment and Pacific Beach Reservoir Site are not included on a list of hazardous materials locations.

- e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two mile of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?
- | | | | |
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| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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Portions of the project alignment are within the Airport Influence Area of the San Diego International Airport Land Use Compatibility Plan. However, since the proposed project involves linear underground sewer and water main repair, it would not introduce any new features that would result in a safety hazard for people residing or working in the area, or create a flight hazard.

- f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?
- | | | | |
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| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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The project site is not within proximity of a private airstrip.

- g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?
- | | | | |
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| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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Construction of the proposed project would temporarily affect traffic circulation within the project Area of Potential Effect (APE) and its adjoining roads. However, an approved Traffic Control Plan would be implemented during construction which would allow emergency plans to be employed. Therefore, the project would not physically interfere with and adopted emergency response plan or emergency evacuation plan.

- h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?
- | | | | |
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| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
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The proposed project would be located within the City's Public Right-of-Way or sewer and water easements, and the Pacific Beach Reservoir site, which are not located within

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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or adjacent to wildlands that could pose a threat of wildland fires. Additionally, sewer and water infrastructure projects do not introduce any new features that would increase the risk of fire.

IX. HYDROLOGY AND WATER QUALITY - Would the project:

- a) Violate any water quality standards or waste discharge requirements?

Potential impacts to existing water quality standards associated with the proposed project would include minimal short-term construction-related erosion sedimentation, but would not include any long term operational storm water impacts. The project would be required to comply with the City’s Storm Water Standards Manual and would have to comply with either a Water Pollution Control Plan or Storm Water Pollution Prevention Plan. These plans would prevent or effectively minimize short-term water quality impacts during construction activities. Therefore, the proposed project would not violate any existing water quality standards or discharge requirements.

- b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

The project does not use groundwater, nor would it create new impervious surfaces that would interfere with groundwater recharge.

- c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner, which would result in substantial erosion or siltation on- or off-site?

All areas that are trenched would be backfilled and resurfaced to their pre-construction condition, including resurfacing trenches within existing improved public rights-of-way. The Pacific Beach Reservoir site will be backfilled, graded and re-vegetated in accordance with an approved City Grading Permit and City grading standards. Thus, the project would not substantially alter drainage patterns.

- d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off-site?

Refer to IX.c.

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| e) Create or contribute runoff water, which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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Refer to IX.c. The project would be required to comply with all local and regional storm water quality standards during construction using approved Best Management Practices (BMPs), which would ensure that water quality is not degraded.

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| f) Otherwise substantially degrade water quality? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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Refer to IX.c. The project would be required to comply with all local and regional storm water quality standards during construction using approved Best Management Practices (BMPs), which would ensure that water quality is not degraded.

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| g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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The project does not propose any housing.

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|---|--------------------------|--------------------------|--------------------------|-------------------------------------|
| h) Place within a 100-year flood hazard area, structures that would impede or redirect flood flows? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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The project does not propose any structures that would impede flood flows as it is a linear underground utility project.

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| i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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The proposed project does not include any features that would increase the risk associated with flooding beyond those of existing conditions.

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| j) Inundation by seiche, tsunami, or mudflow? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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The proposed project does not include any features that would increase the risk

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associated with inundation by seiche, tsunami, or mudflow beyond those of existing conditions.

X. LAND USE AND PLANNING – Would the project:

- a) Physically divide an established community?

The project would involve replacing and installing utility infrastructure underground and would not introduce new features that could divide an established community.

- b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

The project would involve replacing and installing utility infrastructure underground and would be consistent with all applicable land use plans, policies, or regulations of an agency with jurisdiction over the project and would not conflict with any land use plans.

- c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

Refer to IV. The project is not within or adjacent to the preserve areas of the City of San Diego Multiple Species Conservation Program and would therefore not conflict with any applicable habitat conservation plans.

- d) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

The areas around the proposed project alignment and the abandoned reservoir property are not being used for the recovery of mineral resources and are not designed by the General Plan or other local, state or federal land use plan for mineral resources recovery; therefore, the project would not result in the loss of mineral resources.

- e) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

Refer to X.e

XII. NOISE – Would the project result in:

- a) Generation of noise levels in excess of standards established in the local general plan or noise

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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ordinance, or applicable standards of other agencies?

The project would not result in any the generation of operational noise levels in excess of existing standards or existing ambient noise levels in the vicinity of the project.

- b) Generation of excessive ground borne vibration or ground borne noise levels?

The project would not result in any the generation of operational ground borne vibration or noise levels in excess of existing standards or ambient levels.

- c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

Refer to XII.a-b

- d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above existing without the project?

The proposed linear underground sewer and water repair project would result in construction noise, but would be temporary in nature; in addition, the project is required to comply with the San Diego Municipal Code, Chapter 5, Article 9.5, (§59.5.0404 Construction Noise). This section specifies that it is unlawful for any person, between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on legal holidays (with exception of Columbus Day and Washington’s Birthday), or on Sundays, to erect, construct, demolish, excavate for, alter or repair any building or structure in such a manner as to create disturbing, excessive or offensive noise. In addition, the project would be required to conduct any construction activity so as to not cause, at or beyond the property lines of any property zoned residential, an average sound level greater than 75 decibels during the 12-hour period from 7:00 a.m. to 7:00 p.m.

- e) For a project located within an airport land use plan, or, where such a plan has not been adopted, within two miles of a public airport or public use airport would the project expose people residing or working in the area to excessive noise levels?

Portions of the project alignment are within the Airport Influence Area of the San Diego International Airport Land Use Compatibility Plan and most areas have higher ambient noise levels due to the fact that they are located within heavily traveled roadways. The project in and of itself would not generate operational noise. Compliance with OSHA

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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standards will ensure the project workers would not be exposed to excessive noise levels.

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| f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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The project site is not located within the vicinity of a private airstrip.

XIII. POPULATION AND HOUSING – Would the project:

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| a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|---|--------------------------|--------------------------|--------------------------|-------------------------------------|

The project scope does not include the construction of new or extended roads or infrastructure, or new homes and businesses. The project would replace and rehabilitate existing outdated sewer and water infrastructure. Therefore, the project would not induce population growth nor require the construction of new infrastructure.

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| b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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No such displacement would result. There is no existing housing within the boundaries of the proposed project.

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| c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
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No such displacement would result. There is no existing housing or residents within the boundaries of the project.

XIV. PUBLIC SERVICES

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|---|--------------------------|--------------------------|--------------------------|-------------------------------------|
| a) Would the project result in substantial adverse physical impacts associated with the provisions of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service rations, response times or other performance objectives for any of the public services: | | | | |
| i) Fire Protection | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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The project would not result in adverse physical impacts of fire facilities or adversely affect existing levels of fire services.

ii) Police Protection

The project would not affect existing levels of police protection service and would not require the construction or expansion of a police facility.

iii) Schools

The project would not affect existing levels of public services and would not require the construction or expansion of a school facility.

v) Parks

The project would not affect existing levels of public services and would not require the construction or expansion of a park facility.

vi) Other public facilities

The project would not affect existing levels of public services; therefore, no new or altered government facilities would be required.

XV. RECREATION -

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

The project would not adversely affect the availability of and/or need for new or expanded recreational resources.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?

Refer to XV.a. The project does not propose recreation facilities nor require the construction or expansion of any such facilities.

XVI. TRANSPORTATION/TRAFFIC – Would the project?

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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- a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?
- | | | | | |
|--|--------------------------|--------------------------|-------------------------------------|--------------------------|
| | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|--|--------------------------|--------------------------|-------------------------------------|--------------------------|

Construction of the proposed project would temporarily affect traffic circulation within the project Area of Potential Effect (APE) and its adjoining roads. However, an approved Traffic Control Plan would be implemented during construction such that traffic circulation would not be substantially impacted. Therefore, the project would not result in any significant permanent increase in traffic generation.

- b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?
- | | | | | |
|--|--------------------------|--------------------------|-------------------------------------|--------------------------|
| | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
|--|--------------------------|--------------------------|-------------------------------------|--------------------------|

Construction of the proposed project would temporarily affect traffic circulation within the project Area of Potential Effect (APE) and its adjoining roads. However, an approved Traffic Control Plan would be implemented during construction so that existing cumulative or individual levels of service are minimally impacted. Therefore, the project would not result in any significant permanent increase in traffic generation or permanent reduction in level of service.

- c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?
- | | | | | |
|--|--------------------------|--------------------------|--------------------------|-------------------------------------|
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|--|--------------------------|--------------------------|--------------------------|-------------------------------------|

Refer to XVI.c. In addition, the project would not result in safety risks or a change to air traffic patterns in that all work would occur underground or beneath existing bridge structures.

- d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?
- | | | | | |
|--|--------------------------|--------------------------|--------------------------|-------------------------------------|
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
|--|--------------------------|--------------------------|--------------------------|-------------------------------------|

The project would not create a permanent increase in hazards resulting from design features and would reduce temporary hazards due to construction to a less than

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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significant level through a Traffic Control Plan. The project does not propose any change in land use that would affect existing land uses in the area.

- e) Result in inadequate emergency access?

Construction of the proposed project would temporarily affect traffic circulation within the project Area of Potential Effect (APE) and its adjoining roads. However, an approved Traffic Control Plan would be implemented during construction such that emergency access would not be substantially impacted. Therefore, the project would not result in inadequate emergency access.

- f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

The project would temporarily impact circulation during construction activities relative to traffic, pedestrians, public transit and bicycles. However, the preparation of a Traffic Control Plan would ensure that any disruption to these services would not be significant.

XVII. UTILITIES AND SERVICE SYSTEMS – Would the project:

- a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

Construction of the proposed project would facilitate the treatment of wastewater and would not exceed the requirements of the Regional Quality Control Board.

- b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Construction of the proposed project would result in improvements to water and sewer pipeline infrastructure and would not result in a significant unmitigated impact on the environment.

- c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Construction of the proposed project would occur primarily within the PROW and

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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would not create new impervious surfaces. Therefore, the project would not require the construction of new storm water drainage facilities or expansion of existing facilities.

- d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

Construction of the proposed project would not increase the demand for water and would improve the existing water pipelines within the project area.

- e) Result in a determination by the wastewater treatment provided which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?
Refer to XVII.c

- f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

Construction of the project would result in the removal of the abandoned Pacific Beach Reservoir structure, but otherwise would likely generate minimal waste. Project waste would be disposed of in accordance with all applicable local and state regulations pertaining to solid waste including the permitted capacity of the landfill serving the project area. Demolition or construction materials which can be recycled shall comply with the City's Construction and Demolition Debris Ordinance. Operation of the project would not generate waste and, therefore, would not affect the permitted capacity of the landfill serving the project area.

- g) Comply with federal, state, and local statutes and regulation related to solid waste?

Refer to XVII.f. Any solid waste generated during construction related activities would be recycled or disposed of in accordance with all applicable local, state and federal regulations.

XVIII. MANDATORY FINDINGS OF SIGNIFICANCE -

- a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or

Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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prehistory?

The proposed project would not impact any Sensitive Biological Resources and the project would not be located within or adjacent to the Multi Habitat Planning Area (MHPA) of the MSCP. With respect to cultural resources, mitigation for archaeology and paleontology has been incorporated into the MND. Please see Section V of the MND for further details on all mitigation requirements. As a result, project implementation would not result in a significant impact to these resources.

- b) Does the project have impacts that are individually limited, but cumulatively considerable? (“Cumulatively considerable” means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable futures projects)?
-

When viewed in terms of the overall impacts of Citywide linear pipeline repair projects, any potential incremental impacts to cultural resources from this project would be mitigated to below a level of significance. Collectively, all Citywide project impacts on cultural resources are reduced to a less than significant level through project mitigation. Please see Section V of the MND for further details on all mitigation requirements. As a result, project implementation would not result in any individually limited, but cumulatively significant impacts to these resources.

- c) Does the project have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?
-

As stated previously, potentially significant impacts have been identified for archaeological and paleontological resources. However, mitigation has been included in Section V of this MND to reduce impacts to below a level of significance. As such, project implementation would not result in substantial adverse impact on human beings.

INITIAL STUDY CHECKLIST

REFERENCES

I. AESTHETICS / NEIGHBORHOOD CHARACTER

- City of San Diego General Plan; City of San Diego Land Development Municipal Code
- Community Plan.
- Local Coastal Plan.

II. AGRICULTURAL RESOURCES & FOREST RESOURCES

- City of San Diego General Plan.
- U.S. Department of Agriculture, Soil Survey - San Diego Area, California, Part I and II, 1973.
- California Agricultural Land Evaluation and Site Assessment Model (1997)
- Site Specific Report:

III. AIR QUALITY

- California Clean Air Act Guidelines (Indirect Source Control Programs) 1990.
- Regional Air Quality Strategies (RAQS) - APCD.
- Site Specific Report:

IV. BIOLOGY

- City of San Diego, Multiple Species Conservation Program (MSCP), Subarea Plan, 1997
- City of San Diego, MSCP, "Vegetation Communities with Sensitive Species and Vernal Pools" Maps, 1996.
- City of San Diego, MSCP, "Multiple Habitat Planning Area" maps, 1997.
- Community Plan - Resource Element.
- California Department of Fish and Game, California Natural Diversity Database, "State and Federally-listed Endangered, Threatened, and Rare Plants of California," January 2001.

- California Department of Fish & Game, California Natural Diversity Database, "State and Federally-listed Endangered and Threatened Animals of California," January 2001.
- City of San Diego Land Development Code Biology Guidelines.
- Site Specific Report: Biology Letter Report for the Pacific Beach Pipeline Project by Tierra Data Inc, dated August 22, 2014.

V. CULTURAL RESOURCES (INCLUDES HISTORICAL RESOURCES)

- City of San Diego Historical Resources Guidelines.
- City of San Diego Archaeology Library.
- Historical Resources Board List.
- Community Historical Survey:
- Site Specific Reports: Pacific Beach Pipeline Project Historical Resource Technical Report by Rincon Consultants, dated January 6, 2014

VI. GEOLOGY/SOILS

- City of San Diego Seismic Safety Study.
- U.S. Department of Agriculture Soil Survey - San Diego Area, California, Part I and II, December 1973 and Part III, 1975.
- Site Specific Report(s):

VII. GREENHOUSE GAS EMISSIONS

- Site Specific Report: Roadway Construction Emissions Models conducted for the proposed project.

VIII. HAZARDS AND HAZARDOUS MATERIALS

- San Diego County Hazardous Materials Environmental Assessment Listing,
- San Diego County Hazardous Materials Management Division
- FAA Determination
- State Assessment and Mitigation, Unauthorized Release Listing, Public Use Authorized.
- Airport Land Use Compatibility Plan.
- Site Specific Report:

IX. HYDROLOGY/WATER QUALITY

- Flood Insurance Rate Map (FIRM).
- Federal Emergency Management Agency (FEMA), National Flood Insurance Program - Flood Boundary and Floodway Map.
- Clean Water Act Section 303(b) list, http://www.swrcb.ca.gov/tmdl/303d_lists.html.
- Site Specific Reports: Revegetation Plan For The Pacific Beach Reservoir Site by Tierra Data Inc., dated August 2014.

X. LAND USE AND PLANNING

- City of San Diego General Plan.
- Community Plan.
- Airport Land Use Compatibility Plan
- City of San Diego Zoning Maps
- FAA Determination

XI. MINERAL RESOURCES

- California Department of Conservation - Division of Mines and Geology, Mineral Land Classification.
- Division of Mines and Geology, Special Report 153 - Significant Resources Maps.
- Site Specific Report:

XII. NOISE

- Community Plan
- San Diego International Airport - Lindbergh Field CNEL Maps.
- Brown Field Airport Master Plan CNEL Maps.
- Montgomery Field CNEL Maps.
- San Diego Association of Governments - San Diego Regional Average Weekday Traffic Volumes.
- San Diego Metropolitan Area Average Weekday Traffic Volume Maps, SANDAG.
- City of San Diego General Plan.
- Site Specific Report:

XIII. PALEONTOLOGICAL RESOURCES

- City of San Diego Paleontological Guidelines.
- Deméré, Thomas A., and Stephen L. Walsh, "Paleontological Resources City of San Diego," Department of Paleontology San Diego Natural History Museum, 1996.
- Kennedy, Michael P., and Gary L. Peterson, "Geology of the San Diego Metropolitan Area, California. Del Mar, La Jolla, Point Loma, La Mesa, Poway, and SW 1/4 Escondido 7 1/2 Minute Quadrangles," California Division of Mines and Geology Bulletin 200, Sacramento, 1975.
- Kennedy, Michael P., and Siang S. Tan, "Geology of National City, Imperial Beach and Otay Mesa Quadrangles, Southern San Diego Metropolitan Area, California," Map Sheet 29, 1977.
- Site Specific Report:

XIV. POPULATION / HOUSING

- City of San Diego General Plan.
- Community Plan.
- Series 11 Population Forecasts, SANDAG.
- Other:

XV. PUBLIC SERVICES

- City of San Diego General Plan.
- Community Plan.

XVI. RECREATIONAL RESOURCES

- City of San Diego General Plan.
- Community Plan.
- Department of Park and Recreation
- City of San Diego - San Diego Regional Bicycling Map

___ Additional Resources:

XVII. TRANSPORTATION / CIRCULATION

X City of San Diego General Plan.

X Community Plan.

___ San Diego Metropolitan Area Average Weekday Traffic Volume Maps, SANDAG.

___ San Diego Region Weekday Traffic Volumes, SANDAG.

___ Site Specific Report:

XVIII. UTILITIES

X City of San Diego General Plan.

X Community Plan.

XIX. WATER CONSERVATION

X City of San Diego General Plan.

X Community Plan.

___ Sunset Magazine, New Western Garden Book. Rev. ed. Menlo Park, CA: Sunset Magazine.



Edmund G. Brown Jr.
Governor

STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit



Ken Alex
Director

December 8, 2015

Mark Brunette
City of San Diego
1222 First Avenue, MS-501
San Diego, CA 92101

Subject: Montezuma Pipeline/Mid-City Pipeline Phase 2 SDP (PTS No. 406277)
SCH#: 2015111024

Dear Mark Brunette:

The State Clearinghouse submitted the above named Mitigated Negative Declaration to selected state agencies for review. The review period closed on December 7, 2015, and no state agencies submitted comments by that date. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

Please call the State Clearinghouse at (916) 445-0613 if you have any questions regarding the environmental review process. If you have a question about the above-named project, please refer to the ten-digit State Clearinghouse number when contacting this office.

Sincerely,

Scott Morgan
Director, State Clearinghouse

1400 TENTH STREET P.O. BOX 3044 SACRAMENTO, CALIFORNIA 95812-3044
TEL (916) 445-0613 FAX (916) 323-3018 www.opr.ca.gov

**Document Details Report
State Clearinghouse Data Base**

SCH# 2015111024
Project Title Montezuma Pipeline/Mid-City Pipeline Phase 2 SDP (PTS No. 406277)
Lead Agency San Diego, City of

Type MND Mitigated Negative Declaration

Description A Site Development Permit for the installation of approx. 1.16 miles of new water pipelines which consists of 5,680 linear feet of new 66" diameter Cement Lined and Coated Steel transmission main and 422 LF of 8-inch PVC distribution main. The 66-inch transmission main will urn from the Alvarado Water Treatment Plant (AWTP), located at the intersections of Lake Murray Blvd. and Kiowa Dr., to the intersection of 68th and El Cajon Blvd. The northern terminus of the pipeline will be connected to Existing Valve Vault No. 3 located where the Earl Thomas Reservoir Outlet Pipeline intersects the Clear Wells Interconnect Pipeline at the AWTP. The south terminus will be connected to the Mid-City Pipeline Phase 1 project water lines which start on el Cajon Blvd. between 68th and 69th Streets. The project also includes replacement of a remote control panel and antenna mast for the Murray 2nd Pipeline, as well as installation of insert flow meters for the Murray 2nd Pipeline and the Mid-City Pipeline. The majority of the project alignment will be constructed using open trenching. The pipeline will be tunneled and no trenching will be required at three locations: 1) crossing I-8; 2) under the San Diego County Water Authority 108-inch main on Lake Murray Blvd.; and 3) under the San Diego Water Authority 48-inch main on El Cajon Blvd. For the I-8 crossing, the tunnel launching pit will be located in the Denny's parking lot at 6970 Alvarado Road on the south side of I-8, and the receiving pit will be on the north side of I-8 in the City of La Mesa within the Lake Murray Blvd. public right of way. Both tunneling pits will be sited in existing development areas that do not contain sensitive biological resources.

There will be excavations in unpaved areas at the connection with Valve Vault No. 3 at the AWTP and at the Murray 2nd Pipeline. Existing Valve Vault No. 3 is on the City owned land adjacent to Lake Murray Blvd. The excavation for the Murray 21nd Pipeline is partially within a Multiple Habitat Preservation Area. It is on City owned property near the Del Cero Baptist Church at the intersection of Pennsylvania Lane and Delaware Ave. Related work will include traffic control, best management practices for erosion control and storm drain inlet protection, ADA curb ramp installation, pipe abandonment, and resurfacing and restoration of disturbed areas to their original condition. Existing below grade water line will be abandoned along portions of Mohawk Street, 72nd Street, and a public alley north of Mohawk Street.

**Document Details Report
State Clearinghouse Data Base**

Lead Agency Contact

Name Mark Brunette
Agency City of San Diego
Phone 619-446-5379 **Fax**
email
Address 1222 First Avenue, MS-501

City San Diego **State** CA **Zip** 92101

Project Location

County San Diego
City La Mesa, San Diego
Region
Lat / Long 32° 46' 07" N / 117° 02' 50" W
Cross Streets Several including Lake Murray Blvd. and El Cajon Blvd.
Parcel No. 463-010-40, 464-010-07
Township **Range** **Section** **Base**

Proximity to:

Highways 94,8
Airports
Railways MTS
Waterways Lake Murray
Schools SDSU, Crawford, Helix HS
Land Use Public Right of Way, RS-1-2 (Residential - Single Family), AR-1-1 (Agricultural - Residential)

Project Issues Archaeologic-Historic; Biological Resources; Toxic/Hazardous; Landuse

Reviewing Agencies Resources Agency; Department of Fish and Wildlife, Region 5; Department of Parks and Recreation; Department of Water Resources; California Highway Patrol; Caltrans, District 11; Air Resources Board; State Water Resources Control Board, Division of Drinking Water; State Water Resources Control Board, Division of Financial Assistance; Regional Water Quality Control Board, Region 9; Native American Heritage Commission; Public Utilities Commission; State Lands Commission

Date Received 11/06/2015 **Start of Review** 11/06/2015 **End of Review** 12/07/2015

DEPARTMENT OF TRANSPORTATION

DISTRICT 11, DIVISION OF PLANNING

4050 TAYLOR ST, M.S. 240

SAN DIEGO, CA 92110

PHONE (619) 688-6960

FAX (619) 688-4299

TTY 711

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November 19, 2015

11-SD-8

PM 21.81

SCH#2015111024

Montezuma/Mid City Pipelines MND

Mr. Mark Brunette
City of San Diego
1222 1st Ave, M.S. 501
San Diego, CA 92101

Dear Mr. Brunette:

The California Department of Transportation (Caltrans) has received the Mitigated Negative Declaration (MND) dated November 6, 2015, for the Montezuma/Mid City Pipeline Project located at Lake Murray and Interstate 8 (I-8). Caltrans has the following comments:

Any work performed within Caltrans right-of-way (R/W) will require discretionary review and approval by Caltrans and an encroachment permit will be required for any work within the Caltrans R/W prior to construction. As part of the encroachment permit process, the applicant must provide an approved final environmental document including the California Environmental Quality Act (CEQA) determination addressing any environmental impacts within the Caltrans' R/W, and any corresponding technical studies. If these materials are not included with the encroachment permit application, the applicant will be required to acquire and provide these to Caltrans before the permit application will be accepted. Identification of avoidance and/or mitigation measures will be a condition of the encroachment permit approval as well as procurement of any necessary regulatory and resource agency permits. Encroachment permit submittals that are incomplete can result in significant delays in permit approval.

Additional information regarding encroachment permits may be obtained by contacting the Caltrans Permits Office at (619) 688-6158. Early coordination with Caltrans is strongly advised for all encroachment permits.

If you have any questions, please contact Roy Abboud at (619) 688-6968.

Sincerely,

A handwritten signature in blue ink, appearing to read "JMA", written over a light blue horizontal line.

JACOB M. ARMSTRONG, Branch Chief
Development Review Branch

*"Provide a safe, sustainable, integrated and efficient transportation system
to enhance California's economy and livability"*

VIEJAS

TRIBAL GOVERNMENT

PQ Box 908
Alpine, CA 91903
#1 Viejas Grade Road
Alpine, CA 91901

Phone: 6194453810
Fax: 6194455337
viejas.com

November 16, 2015

Mark Brunette
1222 First Avenue, MS 501
San Diego, CA 92101

RE: Montezuma Pipeline/Mid-City Pipeline Phase 2, Project No. 406277

Dear Mr. Brunette,

The Viejas Band of Kumeyaay Indians ("Viejas") has reviewed the proposed project and at this time we have determined that the project site is has cultural significance or ties to Viejas. Viejas Band request that a Kumeyaay Cultural Monitor be on site for ground disturbing activities to inform us of any new developments such as inadvertent discovery of cultural artifacts, cremation sites, or human remains. Please call Julie Hagen for scheduling at 619-659-2339 or email jhagen@viejas-nsn.gov. Thank you

Sincerely,

VIEJAS BAND OF KUMEYAAY INDIANS



San Diego County Archaeological Society, Inc.

Environmental Review Committee

5 December 2015

To: Mr. Mark Brunette
Development Services Department
City of San Diego
1222 First Avenue, Mail Station 501
San Diego, California 92101

Subject: Draft Mitigated Negative Declaration
Montezuma Pipeline/Mid-City Pipeline Phase 2
Project No. 406277

Dear Mr. Brunette:

I have reviewed the subject on behalf of this committee of the San Diego County Archaeological Society.

Based on the information contained in the DMND and the letter report from Helix Environmental Planning, we agree with the mitigation program prescribed for cultural resources.

SDCAS appreciates the opportunity to participate in the environmental review process for this project.

Sincerely,


James W. Royle, Jr., Chairperson
Environmental Review Committee

cc: Helix Environmental Planning
SDCAS President
File

RINCON BAND OF LUISEÑO INDIANS

Culture Committee

1 W. Tribal Road · Valley Center, California 92082 ·
(760) 297-2621 or (760) 297-2622 & Fax: (760) 749-8901



November 16, 2015

Mark Brunette
The City of San Diego
Development Services Department
1222 First Avenue, MS 501
San Diego, CA 92101

Re: Montezuma Pipeline/Mid-City Pipeline Phase 2

Dear Mr. Burnette:

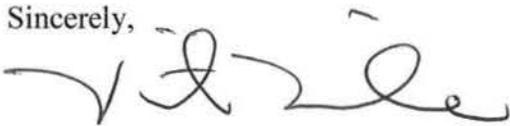
This letter is written on behalf of the Rincon Band of Luiseño Indians. Thank you for inviting us to submit comments on the Montezuma Pipeline/Mid-City Pipeline Phase 2 Project. Rincon is submitting these comments concerning your projects potential impact on Luiseño cultural resources.

The Rincon Band has concerns for the impacts to historic and cultural resources and the finding of items of significant cultural value that could be disturbed or destroyed and are considered culturally significant to the Luiseño people. This is to inform you, your identified location is not within the Luiseño Aboriginal Territory. We recommend that you locate a tribe within the project area to receive direction on how to handle any inadvertent findings according to their customs and traditions.

If you would like information on tribes within your project area, please contact the Native American Heritage Commission and they will assist with a referral.

Thank you for the opportunity to protect and preserve our cultural assets.

Sincerely,



Vincent Whipple
Manager
Rincon Cultural Resources Department

Bo Mazzetti
Tribal Chairman

Stephanie Spencer
Vice Chairwoman

Steve Stallings
Council Member

Laurie E. Gonzalez
Council Member

Alfonso Kolb
Council Member

**PALA TRIBAL HISTORIC
PRESERVATION OFFICE**

PMB 50, 35008 Pala Temecula Road
Pala, CA 92059
760-891-3510 Office | 760-742-3189 Fax



December 21, 2015

Mark Brunette
City of San Diego, Planning Dept.
1222 First Ave, MS 413
San Diego, CA 92101

Re: Montezuma Pipeline/ Mid- City Pipeline Phase 2- Project No. 406277

Dear Mr. Brunette:

The Pala Band of Mission Indians Tribal Historic Preservation Office has received your notification of the project referenced above. This letter constitutes our response on behalf of Robert Smith, Tribal Chairman.

We have consulted our maps and determined that the project as described is not within the boundaries of the recognized Pala Indian Reservation. The project is also beyond the boundaries of the territory that the tribe considers its Traditional Use Area (TUA). Therefore, we have no objection to the continuation of project activities as currently planned and we defer to the wishes of Tribes in closer proximity to the project area.

We appreciate involvement with your initiative and look forward to working with you on future efforts. If you have questions or need additional information, please do not hesitate to contact me by telephone at 760-891-3515 or by e-mail at sgaughen@palatribe.com.

Sincerely,

Shasta C. Gaughen, PhD
Tribal Historic Preservation Officer
Pala Band of Mission Indians

ATTENTION: THE PALA TRIBAL HISTORIC PRESERVATION OFFICE IS RESPONSIBLE FOR ALL REQUESTS FOR CONSULTATION. PLEASE ADDRESS CORRESPONDENCE TO **SHASTA C. GAUGHEN** AT THE ABOVE ADDRESS. IT IS NOT NECESSARY TO ALSO SEND NOTICES TO PALA TRIBAL CHAIRMAN ROBERT SMITH.

APPENDIX B
FIRE HYDRANT METER PROGRAM

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 1 OF 10	EFFECTIVE DATE October 15, 2002
	SUPERSEDES DI 55.27	DATED April 21, 2000

1. **PURPOSE**

- 1.1 To establish a Departmental policy and procedure for issuance, proper usage and charges for fire hydrant meters.

2. **AUTHORITY**

- 2.1 All authorities and references shall be current versions and revisions.
- 2.2 San Diego Municipal Code (NC) Chapter VI, Article 7, Sections 67.14 and 67.15
- 2.3 Code of Federal Regulations, Safe Drinking Water Act of 1986
- 2.4 California Code of Regulations, Titles 17 and 22
- 2.5 California State Penal Code, Section 498B.0
- 2.6 State of California Water Code, Section 110, 500-6, and 520-23
- 2.7 Water Department Director

Reference

- 2.8 State of California Guidance Manual for Cross Connection Programs
- 2.9 American Water Works Association Manual M-14, Recommended Practice for Backflow Prevention
- 2.10 American Water Works Association Standards for Water Meters
- 2.11 U.S.C. Foundation for Cross Connection Control and Hydraulic Research Manual

3. **DEFINITIONS**

- 3.1 **Fire Hydrant Meter:** A portable water meter which is connected to a fire hydrant for the purpose of temporary use. (These meters are sometimes referred to as Construction Meters.)

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 2 OF 10	EFFECTIVE DATE October 15, 2002
	SUPERSEDES DI 55.27	DATED April 21, 2000

- 3.2 **Temporary Water Use:** Water provided to the customer for no longer than twelve (12) months.
- 3.3 **Backflow Preventor:** A Reduced Pressure Principal Assembly connected to the outlet side of a Fire Hydrant Meter.

4. **POLICY**

- 4.1 The Water Department shall collect a deposit from every customer requiring a fire hydrant meter and appurtenances prior to providing the meter and appurtenances (see Section 7.1 regarding the Fees and Deposit Schedule). The deposit is refundable upon the termination of use and return of equipment and appurtenances in good working condition.
- 4.2 Fire hydrant meters will have a 2 ½" swivel connection between the meter and fire hydrant. The meter shall not be connected to the 4" port on the hydrant. All Fire Hydrant Meters issued shall have a Reduced Pressure Principle Assembly (RP) as part of the installation. Spanner wrenches are the only tool allowed to turn on water at the fire hydrant.
- 4.3 The use of private hydrant meters on City hydrants is prohibited, with exceptions as noted below. All private fire hydrant meters are to be phased out of the City of San Diego. All customers who wish to continue to use their own fire hydrant meters must adhere to the following conditions:
 - a. Meters shall meet all City specifications and American Water Works Association (AWWA) standards.
 - b. Customers currently using private fire hydrant meters in the City of San Diego water system will be allowed to continue using the meter under the following conditions:
 - 1. The customer must submit a current certificate of accuracy and calibration results for private meters and private backflows annually to the City of San Diego, Water Department, Meter Shop.

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
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2. The meter must be properly identifiable with a clearly labeled serial number on the body of the fire hydrant meter. The serial number shall be plainly stamped on the register lid and the main casing. Serial numbers shall be visible from the top of the meter casing and the numbers shall be stamped on the top of the inlet casing flange.
3. All meters shall be locked to the fire hydrant by the Water Department, Meter Section (see Section 4.7).
4. All meters shall be read by the Water Department, Meter Section (see Section 4.7).
5. All meters shall be relocated by the Water Department, Meter Section (see Section 4.7).
6. These meters shall be tested on the anniversary of the original test date and proof of testing will be submitted to the Water Department, Meter Shop, on a yearly basis. If not tested, the meter will not be allowed for use in the City of San Diego.
7. All private fire hydrant meters shall have backflow devices attached when installed.
8. The customer must maintain and repair their own private meters and private backflows.
9. The customer must provide current test and calibration results to the Water Department, Meter Shop after any repairs.
10. When private meters are damaged beyond repair, these private meters will be replaced by City owned fire hydrant meters.

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11. When a private meter malfunctions, the customer will be notified and the meter will be removed by the City and returned to the customer for repairs. Testing and calibration results shall be given to the City prior to any re-installation.
 12. The register shall be hermetically sealed straight reading and shall be readable from the inlet side. Registration shall be in hundred cubic feet.
 13. The outlet shall have a 2 ½ “National Standards Tested (NST) fire hydrant male coupling.
 14. Private fire hydrant meters shall not be transferable from one contracting company to another (i.e. if a company goes out of business or is bought out by another company).
- 4.4 All fire hydrant meters and appurtenances shall be installed, relocated and removed by the City of San Diego, Water Department. All City owned fire hydrant meters and appurtenances shall be maintained by the City of San Diego, Water Department, Meter Services.
- 4.5 If any fire hydrant meter is used in violation of this Department Instruction, the violation will be reported to the Code Compliance Section for investigation and appropriate action. Any customer using a fire hydrant meter in violation of the requirements set forth above is subject to fines or penalties pursuant to the Municipal Code, Section 67.15 and Section 67.37.
- 4.6 Conditions and Processes for Issuance of a Fire Hydrant Meter**
- Process for Issuance
- a. Fire hydrant meters shall only be used for the following purposes:
 1. Temporary irrigation purposes not to exceed one year.

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2. Construction and maintenance related activities (see Tab 2).
 - b. No customer inside or outside the boundaries of the City of San Diego Water Department shall resell any portion of the water delivered through a fire hydrant by the City of San Diego Water Department.
 - c. The City of San Diego allows for the issuance of a temporary fire hydrant meter for a period not to exceed 12 months (365 days). An extension can only be granted in writing from the Water Department Director for up to 90 additional days. A written request for an extension by the consumer must be submitted at least 30 days prior to the 12 month period ending. No extension shall be granted to any customer with a delinquent account with the Water Department. No further extensions shall be granted.
 - d. Any customer requesting the issuance of a fire hydrant meter shall file an application with the Meter Section. The customer must complete a "Fire Hydrant Meter Application" (Tab 1) which includes the name of the company, the party responsible for payment, Social Security number and/or California ID, requested location of the meter (a detailed map signifying an exact location), local contact person, local phone number, a contractor's license (or a business license), description of specific water use, duration of use at the site and full name and address of the person responsible for payment.
 - e. At the time of the application the customer will pay their fees according to the schedule set forth in the Rate Book of Fees and Charges, located in the City Clerk's Office. All fees must be paid by check, money order or cashiers check, made payable to the City Treasurer. Cash will not be accepted.
 - f. No fire hydrant meters shall be furnished or relocated for any customer with a delinquent account with the Water Department.
 - g. After the fees have been paid and an account has been created, the

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meter shall be installed within 48 hours (by the second business day). For an additional fee, at overtime rates, meters can be installed within 24 hours (within one business day).

4.7 Relocation of Existing Fire Hydrant Meters

- a. The customer shall call the Fire Hydrant Meter Hotline (herein referred to as “Hotline”), a minimum of 24 hours in advance, to request the relocation of a meter. A fee will be charged to the existing account, which must be current before a work order is generated for the meter’s relocation.
- b. The customer will supply in writing the address where the meter is to be relocated (map page, cross street, etc). The customer must update the original Fire Hydrant Meter Application with any changes as it applies to the new location.
- c. Fire hydrant meters shall be read on a monthly basis. While fire hydrant meters and backflow devices are in service, commodity, base fee and damage charges, if applicable, will be billed to the customer on a monthly basis. If the account becomes delinquent, the meter will be removed.

4.8 Disconnection of Fire Hydrant Meter

- a. After ten (10) months a “Notice of Discontinuation of Service” (Tab 3) will be issued to the site and the address of record to notify the customer of the date of discontinuance of service. An extension can only be granted in writing from the Water Department Director for up to 90 additional days (as stated in Section 4.6C) and a copy of the extension shall be forwarded to the Meter Shop Supervisor. If an extension has not been approved, the meter will be removed after twelve (12) months of use.
- b. Upon completion of the project the customer will notify the Meter Services office via the Hotline to request the removal of the fire hydrant meter and appurtenances. A work order will be generated

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for removal of the meter.

- c. Meter Section staff will remove the meter and backflow prevention assembly and return it to the Meter Shop. Once returned to the Meter Shop the meter and backflow will be tested for accuracy and functionality.
- d. Meter Section Staff will contact and notify Customer Services of the final read and any charges resulting from damages to the meter and backflow or its appurtenance. These charges will be added on the customer's final bill and will be sent to the address of record. Any customer who has an outstanding balance will not receive additional meters.
- e. Outstanding balances due may be deducted from deposits and any balances refunded to the customer. Any outstanding balances will be turned over to the City Treasurer for collection. Outstanding balances may also be transferred to any other existing accounts.

5. **EXCEPTIONS**

- 5.1 Any request for exceptions to this policy shall be presented, in writing, to the Customer Support Deputy Director, or his/her designee for consideration.

6. **MOBILE METER**

- 6.1 Mobile meters will be allowed on a case by case basis. All mobile meters will be protected by an approved backflow assembly and the minimum requirement will be a Reduced Pressure Principal Assembly. The two types of Mobile Meters are vehicle mounted and floating meters. Each style of meters has separate guidelines that shall be followed for the customer to retain service and are described below:

- a) **Vehicle Mounted Meters:** Customer applies for and receives a City owned Fire Hydrant Meter from the Meter Shop. The customer mounts the meter on the vehicle and brings it to the Meter Shop for

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inspection. After installation is approved by the Meter Shop the vehicle and meter shall be brought to the Meter Shop on a monthly basis for meter reading and on a quarterly basis for testing of the backflow assembly. Meters mounted at the owner's expense shall have the one year contract expiration waived and shall have meter or backflow changed if either fails.

b) **Floating Meters:** Floating Meters are meters that are not mounted to a vehicle. **(Note: All floating meters shall have an approved backflow assembly attached.)** The customer shall submit an application and a letter explaining the need for a floating meter to the Meter Shop. The Fire Hydrant Meter Administrator, after a thorough review of the needs of the customer, (i.e. number of jobsites per day, City contract work, lack of mounting area on work vehicle, etc.), may issue a floating meter. At the time of issue, it will be necessary for the customer to complete and sign the "Floating Fire Hydrant Meter Agreement" which states the following:

- 1) The meter will be brought to the Meter Shop at 2797 Caminito Chollas, San Diego on the third week of each month for the monthly read by Meter Shop personnel.
- 2) Every other month the meter will be read and the backflow will be tested. This date will be determined by the start date of the agreement.

If any of the conditions stated above are not met the Meter Shop has the right to cancel the contract for floating meter use and close the account associated with the meter. The Meter Shop will also exercise the right to refuse the issuance of another floating meter to the company in question.

Any Fire Hydrant Meter using reclaimed water shall not be allowed use again with any potable water supply. The customer shall incur the cost of replacing the meter and backflow device in this instance.

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7. **FEE AND DEPOSIT SCHEDULES**

7.1 **Fees and Deposit Schedules:** The fees and deposits, as listed in the Rate Book of Fees and Charges, on file with the Office of the City Clerk, are based on actual reimbursement of costs of services performed, equipment and materials. These deposits and fees will be amended, as needed, based on actual costs. Deposits, will be refunded at the end of the use of the fire hydrant meter, upon return of equipment in good working condition and all outstanding balances on account are paid. Deposits can also be used to cover outstanding balances.

All fees for equipment, installation, testing, relocation and other costs related to this program are subject to change without prior notification. The Mayor and Council will be notified of any future changes.

8. **UNAUTHORIZED USE OF WATER FROM A HYDRANT**

8.1 Use of water from any fire hydrant without a properly issued and installed fire hydrant meter is theft of City property. Customers who use water for unauthorized purposes or without a City of San Diego issued meter will be prosecuted.

8.2 If any unauthorized connection, disconnection or relocation of a fire hydrant meter, or other connection device is made by anyone other than authorized Water Department personnel, the person making the connection will be prosecuted for a violation of San Diego Municipal Code, Section 67.15. In the case of a second offense, the customer's fire hydrant meter shall be confiscated and/or the deposit will be forfeited.

8.3 Unauthorized water use shall be billed to the responsible party. Water use charges shall be based on meter readings, or estimates when meter readings are not available.

8.4 In case of unauthorized water use, the customer shall be billed for all applicable charges as if proper authorization for the water use had been obtained, including but not limited to bi-monthly service charges, installation charges and removal charges.

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- 8.5 If damage occurs to Water Department property (i.e. fire hydrant meter, backflow, various appurtenances), the cost of repairs or replacements will be charged to the customer of record (applicant).

**Larry Gardner
Water Department Director**

- Tabs: 1. Fire Hydrant Meter Application
2. Construction & Maintenance Related Activities With No Return To Sewer
3. Notice of Discontinuation of Service

APPENDIX

Administering Division: Customer Support Division

Subject Index: Construction Meters
Fire Hydrant
Fire Hydrant Meter Program
Meters, Floating or Vehicle Mounted
Mobile Meter
Program, Fire Hydrant Meter

Distribution: DI Manual Holders



Application for Fire Hydrant Meter (EXHIBIT A)

(For Office Use Only)

NS REQ	FAC#
DATE	BY

METER SHOP (619) 527-7449

Meter Information

Application Date	Requested Install Date:
------------------	-------------------------

Fire Hydrant Location: (Attach Detailed Map//Thomas Bros. Map Location or Construction drawing.) <u>Zip:</u>	T.B.	G.B. (CITY USE)
Specific Use of Water:		
Any Return to Sewer or Storm Drain, if so, explain:		
Estimated Duration of Meter Use: <input type="text"/>	<input type="checkbox"/>	Check Box if Reclaimed Water

Company Information

Company Name:			
Mailing Address:			
City:	State:	Zip:	Phone: ()
*Business license#		*Contractor license#	
A Copy of the Contractor's license OR Business License is required at the time of meter issuance.			
Name and Title of Billing Agent: <small>(PERSON IN ACCOUNTS PAYABLE)</small>			Phone: ()
Site Contact Name and Title:			Phone: ()
Responsible Party Name:			Title:
Cal ID#			Phone: ()
Signature:		Date:	
<small>Guarantees Payment of all Charges Resulting from the use of this Meter. Insures that employees of this Organization understand the proper use of Fire Hydrant Meter</small>			

Fire Hydrant Meter Removal Request	Requested Removal Date:
Provide Current Meter Location if Different from Above:	
Signature:	Title: Date:
Phone: ()	Pager: ()

<input type="checkbox"/> City Meter	<input type="checkbox"/> Private Meter	
Contract Acct #:	Deposit Amount: \$ 936.00	Fees Amount: \$ 62.00
Meter Serial #	Meter Size: 05	Meter Make and Style: 6-7
Backflow #	Backflow Size:	Backflow Make and Style:
Name:	Signature:	Date:

WATER USES WITHOUT ANTICIPATED CHARGES FOR RETURN TO SEWER

Auto Detailing
Backfilling
Combination Cleaners (Vactors)
Compaction
Concrete Cutters
Construction Trailers
Cross Connection Testing
Dust Control
Flushing Water Mains
Hydro Blasting
Hydro Seeing
Irrigation (for establishing irrigation only; not continuing irrigation)
Mixing Concrete
Mobile Car Washing
Special Events
Street Sweeping
Water Tanks
Water Trucks
Window Washing

Note:

1. If there is any return to sewer or storm drain, then sewer and/or storm drain fees will be charges.

Date

Name of Responsible Party
Company Name and Address
Account Number: _____

Subject: Discontinuation of Fire Hydrant Meter Service

Dear Water Department Customer:

The authorization for use of Fire Hydrant Meter # _____, located at *(Meter Location Address)* ends in 60 days and will be removed on or after *(Date Authorization Expires)*. Extension requests for an additional 90 days must be submitted in writing for consideration 30 days prior to the discontinuation date. If you require an extension, please contact the Water Department, or mail your request for an extension to:

City of San Diego
Water Department
Attention: Meter Services
2797 Caminito Chollas
San Diego, CA 92105-5097

Should you have any questions regarding this matter, please call the Fire Hydrant Hotline at (619) _____ - _____.

Sincerely,

Water Department

APPENDIX C

MATERIALS TYPICALLY ACCEPTED BY CERTIFICATE OF COMPLIANCE

Materials Typically Accepted by Certificate of Compliance

1. Soil amendment
2. Fiber mulch
3. PVC or PE pipe up to 16 inch diameter
4. Stabilizing emulsion
5. Lime
6. Preformed elastomeric joint seal
7. Plain and fabric reinforced elastomeric bearing pads
8. Steel reinforced elastomeric bearing pads
9. Waterstops (Special Condition)
10. Epoxy coated bar reinforcement
11. Plain and reinforcing steel
12. Structural steel
13. Structural timber and lumber
14. Treated timber and lumber
15. Lumber and timber
16. Aluminum pipe and aluminum pipe arch
17. Corrugated steel pipe and corrugated steel pipe arch
18. Structural metal plate pipe arches and pipe arches
19. Perforated steel pipe
20. Aluminum underdrain pipe
21. Aluminum or steel entrance tapers, pipe downdrains, reducers, coupling bands and slip joints
22. Metal target plates
23. Paint (traffic striping)
24. Conductors
25. Painting of electrical equipment
26. Electrical components
27. Engineering fabric
28. Portland Cement
29. PCC admixtures
30. Minor concrete, asphalt
31. Asphalt (oil)
32. Liquid asphalt emulsion
33. Epoxy

APPENDIX D

SAMPLE CITY INVOICE

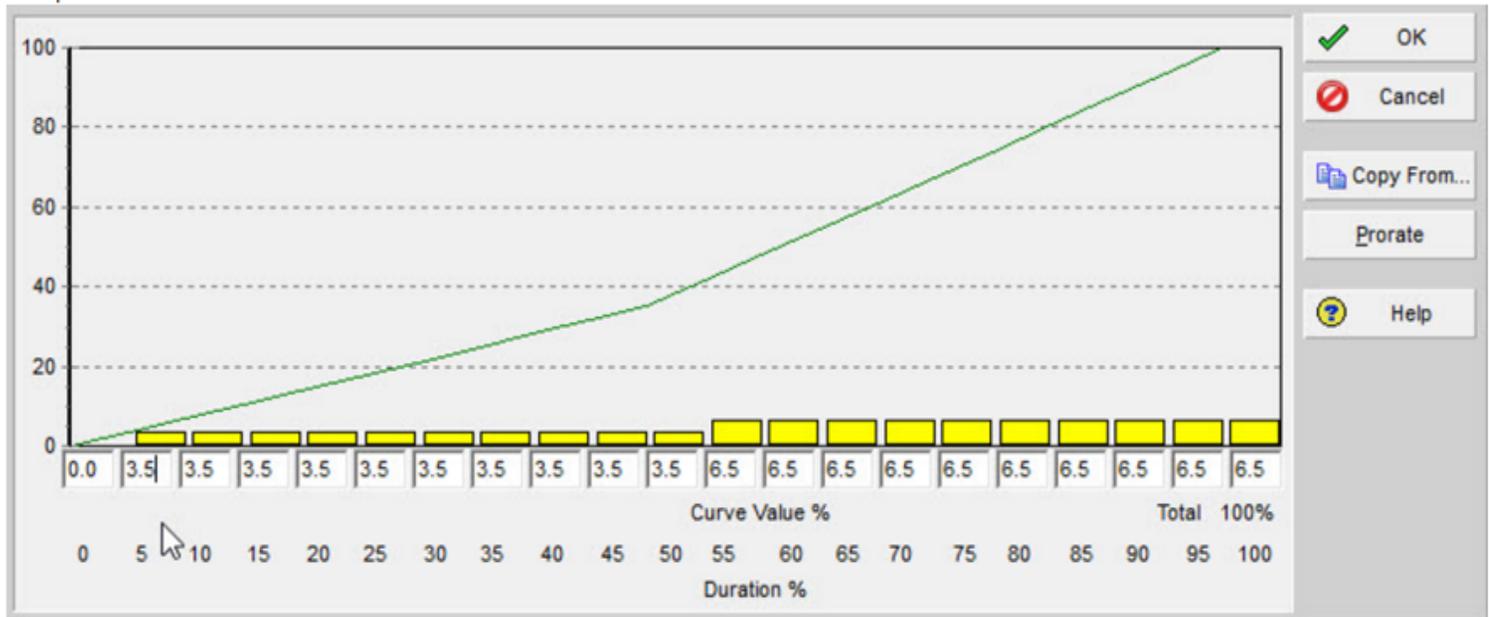
Sample Project Spend Curve

Sample Date Entries Required

Incremental Curve Value
Duration % Increment

0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%
0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%

Sample Screenshot from Primavera P6



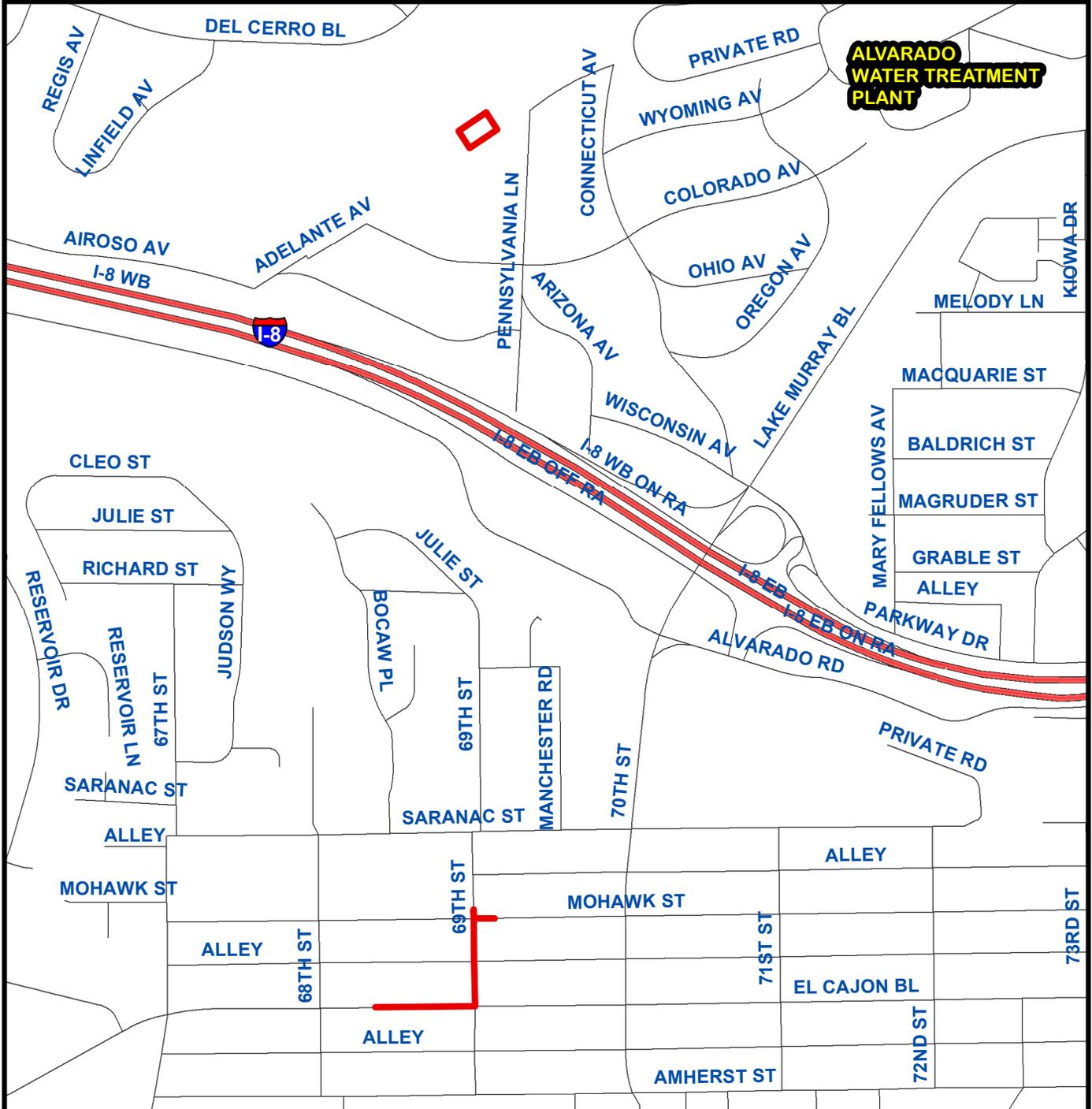
APPENDIX E
LOCATION MAP

THIS MAP/DATA IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Note: This product may contain information reproduced with permission granted by RAND McNALLY & COMPANY to SanGIS. This map is copyrighted by RAND McNALLY & COMPANY. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without the prior, written permission of RAND McNALLY & COMPANY.



The City of
SAN DIEGO Public Works
 Mid-City Pipeline Project - Phase 2a

FOR QUESTIONS ABOUT THIS PROJECT
 Call: (619) 533-4207
 Email: engineering@sandiego.gov



**ALVARADO
 WATER TREATMENT
 PLANT**

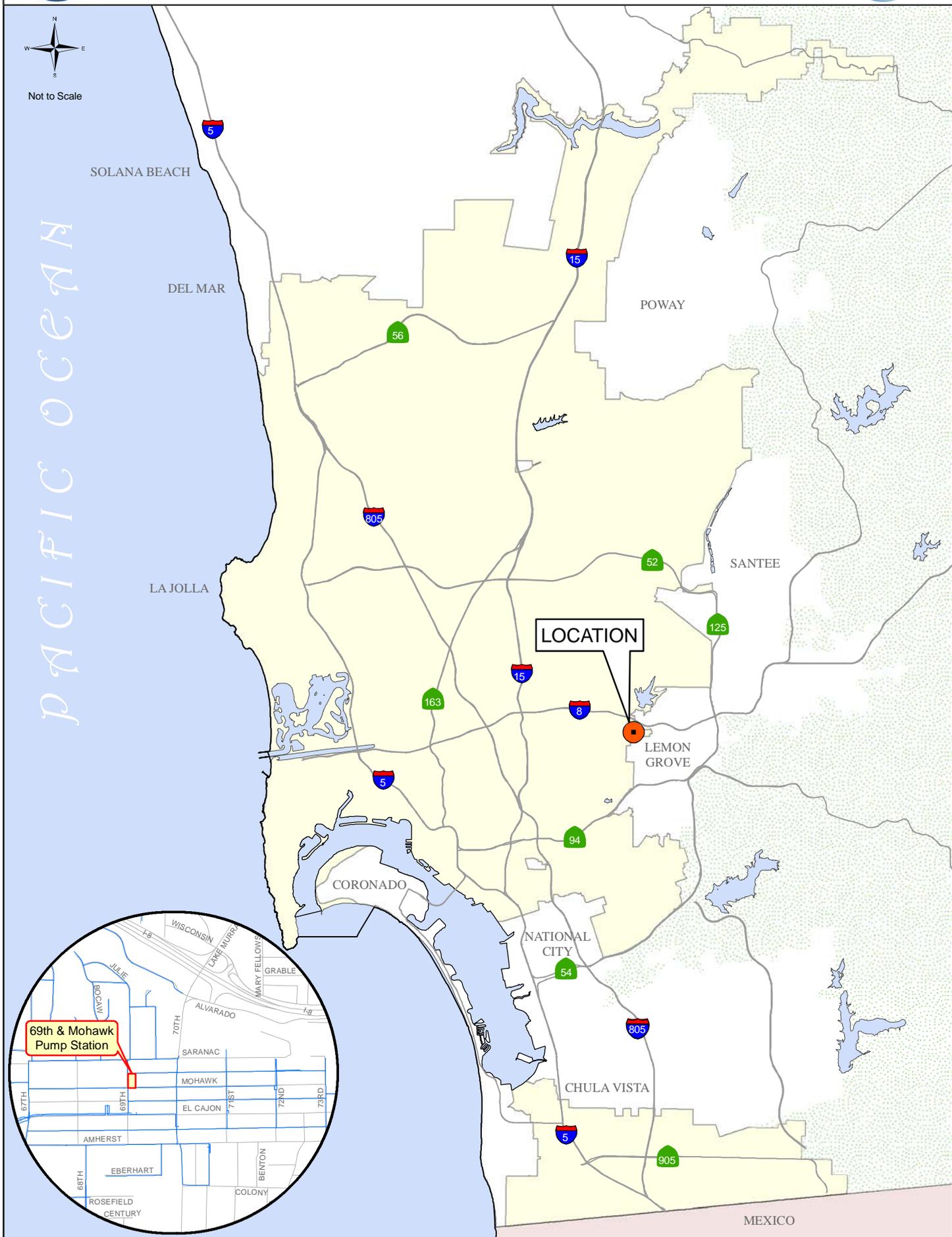
-  Mid City Pipeline Phase 2a
-  SCADA-Mid City Phase 2a



APPENDIX F
ADJACENT PROJECTS



69TH & MOHAWK PUMP STATION Vicinity Map



APPENDIX G
HYDROSTATIC DISCHARGE FORM

Hydrostatic Discharge Requirements Certification (Discharge Events ≥ 325,850 gpd)

All discharge activities related to this project comply with the Regional Water Quality Control Board (RWQCB) Order No. R9-2010-0003, General Permit for Discharges of Hydrostatic Test Water and Potable Water to Surface Water and Storm Drains as referenced by (http://www.waterboards.ca.gov/sandiego/board_decisions/adopted_orders/2010/R9-2010-0003.pdf), and as follows:

Discharged water has been dechlorinated to below 0.1 (mg/l) level; and effluent has been maintained between 6 and 9 (pH) based on:

Is Discharge Within Limits?

Comment/Action Taken

Event #	Discharge Date	Item Tested	Duration	Amount (gpd)	Description of the Proposed Discharge	Method and Test Result	Is Discharge Within Limits?		Comment/Action Taken
							YES	NO	
		Chlorine							
		pH							
		Chlorine							
		pH							
		Chlorine							
		pH							
		Chlorine							
		pH							

Qualified Personnel Conducting Tests (Print Name):

SAP No.(s):

***Signed:**

Project Name:

* By signing, I hereby certify and affirm under penalty of perjury that all of the statements and conditions for hydrostatic discharge events are correct.

Have any thresholds been exceeded? Per Order No. R9-2010-0003, would this be a reportable discharge and must be reported **within 24 hours** of the event? [Reportable discharge would include violation of maximum gallons per day, any upset which exceeds any effluent limit]

APPENDIX H
HAZARDOUS LABEL/FORMS

HAZARDOUS WASTE

STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY
AUTHORITY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY
OR THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES

GENERATOR NAME _____

ADDRESS _____ 24 HR. PHONE () _____

CITY _____ STATE _____ ZIP _____

EPA ID NO. _____ MANIFEST DOCUMENT NO. _____

EPA WASTE NO. _____ CA WASTE NO. _____ ACCUMULATION START DATE _____ / ____ / ____

CONTENTS, COMPOSITION _____

PROPER DOT SHIPPING NAME _____

TECHNICAL NAME (S) _____

UN/NA NO. WITH PREFIX _____

PHYSICAL STATE | HAZARDOUS PROPERTIES FLAMMABLE TOXIC
 SOLID LIQUID | CORROSIVE REACTIVE OTHER _____

HANDLE WITH CARE!
CONTAINS HAZARDOUS OR TOXIC WASTES

INCIDENT/RELEASE ASSESSMENT FORM ¹

If you have an emergency, Call 911

Handlers of hazardous materials are required to report releases. The following is a tool to be used for assessing if a release is reportable. Additionally, a non-reportable release incident form is provided to document why a release is not reported (see back).

Questions for Incident Assessment:

	YES	NO
1. Was anyone killed or injured, or did they require medical care or admitted to a hospital for observation?	<input type="checkbox"/>	<input type="checkbox"/>
2. Did anyone, other than employees in the immediate area of the release, evacuate?	<input type="checkbox"/>	<input type="checkbox"/>
3. Did the release cause off-site damage to public or private property?	<input type="checkbox"/>	<input type="checkbox"/>
4. Is the release greater than or equal to a reportable quantity (RQ)?	<input type="checkbox"/>	<input type="checkbox"/>
5. Was there an uncontrolled or unpermitted release to the air?	<input type="checkbox"/>	<input type="checkbox"/>
6. Did an uncontrolled or unpermitted release escape secondary containment, or extend into any sewers, storm water conveyance systems, utility vaults and conduits, wetlands, waterways, public roads, or off site?	<input type="checkbox"/>	<input type="checkbox"/>
7. Will control, containment, decontamination, and/or clean up require the assistance of federal, state, county, or municipal response elements?	<input type="checkbox"/>	<input type="checkbox"/>
8. Was the release or threatened release involving an unknown material or contains an unknown hazardous constituent?	<input type="checkbox"/>	<input type="checkbox"/>
9. Is the incident a threatened release (a condition creating a substantial probability of harm that requires immediate action to prevent, reduce, or mitigate damages to persons, property, or the environment)?	<input type="checkbox"/>	<input type="checkbox"/>
10. Is there an increased potential for secondary effects including fire, explosion, line rupture, equipment failure, or other outcomes that may endanger or cause exposure to employees, the general public, or the environment?	<input type="checkbox"/>	<input type="checkbox"/>

If the answer is YES to any of the above questions – report the release to the California Office of Emergency Services at 800-852-7550 and the local CUPA daytime: (619) 338-2284, after hours: (858) 565-5255. Note: other state and federal agencies may require notification depending on the circumstances.

Call 911 in an emergency

If all answers are NO, complete a Non Reportable Release Incident Form (page 2 of 2) and keep readily available. Documenting why a “no” response was made to each question will serve useful in the event questions are asked in the future, and to justify not reporting to an outside regulatory agency.

If in doubt, report the release.

¹ This document is a guide for accessing when hazardous materials release reporting is required by Chapter 6.95 of the California Health and Safety Code. It does not replace good judgment, Chapter 6.95, or other state or federal release reporting requirements.

NON REPORTABLE RELEASE INCIDENT FORM

1. RELEASE AND RESPONSE DESCRIPTION

Incident # _____

Date/Time Discovered	Date/Time Discharge	Discharge Stopped <input type="checkbox"/> Yes <input type="checkbox"/> No
Incident Date / Time:		
Incident Business / Site Name:		
Incident Address:		
Other Locators (Bldg, Room, Oil Field, Lease, Well #, GIS)		
Please describe the incident and indicate specific causes and area affected. Photos Attached?: <input type="checkbox"/> Yes <input type="checkbox"/> No		
Indicate actions to be taken to prevent similar releases from occurring in the future.		

2. ADMINISTRATIVE INFORMATION

Supervisor in charge at time of incident:	Phone:
Contact Person:	Phone:

3. CHEMICAL INFORMATION

Chemical	Quantity <input type="checkbox"/> GAL <input type="checkbox"/> LBS <input type="checkbox"/> FT ³
Chemical	Quantity <input type="checkbox"/> GAL <input type="checkbox"/> LBS <input type="checkbox"/> FT ³
Chemical	Quantity <input type="checkbox"/> GAL <input type="checkbox"/> LBS <input type="checkbox"/> FT ³
Clean-Up Procedures & Timeline:	
Completed By:	Phone:
Print Name:	Title:

EMERGENCY RELEASE FOLLOW - UP NOTICE REPORTING FORM

A	BUSINESS NAME	FACILITY EMERGENCY CONTACT & PHONE NUMBER () -	
B	INCIDENT DATE MO DAY YR	TIME OES NOTIFIED (use 24 hr time)	OES CONTROL NO.
C	INCIDENT ADDRESS LOCATION	CITY / COMMUNITY	COUNTY ZIP
D	CHEMICAL OR TRADE NAME (print or type)		CAS Number
D	CHECK IF CHEMICAL IS LISTED IN 40 CFR 355, APPENDIX A <input type="checkbox"/>	CHECK IF RELEASE REQUIRES NOTIFICATION UNDER 42 U.S.C. Section 9603 (a) <input type="checkbox"/>	
D	PHYSICAL STATE CONTAINED <input type="checkbox"/> SOLID <input type="checkbox"/> LIQUID <input type="checkbox"/> GAS	PHYSICAL STATE RELEASED <input type="checkbox"/> SOLID <input type="checkbox"/> LIQUID <input type="checkbox"/> GAS	QUANTITY RELEASED
D	ENVIRONMENTAL CONTAMINATION <input type="checkbox"/> AIR <input type="checkbox"/> WATER <input type="checkbox"/> GROUND <input type="checkbox"/> OTHER	TIME OF RELEASE	DURATION OF RELEASE — DAYS — HOURS — MINUTES
E	ACTIONS TAKEN		
F	KNOWN OR ANTICIPATED HEALTH EFFECTS (Use the comments section for addition information)		
	<input type="checkbox"/> ACUTE OR IMMEDIATE (explain) _____		
	<input type="checkbox"/> CHRONIC OR DELAYED (explain) _____		
	<input type="checkbox"/> NOTKNOWN (explain) _____		
G	ADVICE REGARDING MEDICAL ATTENTION NECESSARY FOR EXPOSED INDIVIDUALS		
H	COMMENTS (INDICATE SECTION (A - G) AND ITEM WITH COMMENTS OR ADDITIONAL INFORMATION)		
I	CERTIFICATION: I certify under penalty of law that I have personally examined and I am familiar with the information submitted and believe the submitted information is true, accurate, and complete.		
	REPORTING FACILITY REPRESENTATIVE (print or type) _____		
	SIGNATURE OF REPORTING FACILITY REPRESENTATIVE _____		DATE: _____

EMERGENCY RELEASE FOLLOW-UP NOTICE REPORTING FORM INSTRUCTIONS

GENERAL INFORMATION:

Chapter 6.95 of Division 20 of the California Health and Safety Code requires that written emergency release follow-up notices prepared pursuant to 42 U.S.C. § 11004, be submitted using this reporting form. Non-permitted releases of reportable quantities of Extremely Hazardous Substances (listed in 40 CFR 355, appendix A) or of chemicals that require release reporting under section 103(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [42 U.S.C. § 9603(a)] must be reported on the form, as soon as practicable, but no later than 30 days, following a release. The written follow-up report is required in addition to the verbal notification.

BASIC INSTRUCTIONS:

- The form, when filled out, reports follow-up information required by 42 U.S.C § 11004. Ensure that all information requested by the form is provided as completely as possible.
- If the incident involves reportable releases of more than one chemical, prepare one report form for each chemical released.
- If the incident involves a series of separate releases of chemical(s) at different times, the releases should be reported on separate reporting forms.

SPECIFIC INSTRUCTIONS:

Block A: Enter the name of the business and the name and phone number of a contact person who can provide detailed facility information concerning the release.

Block B: Enter the date of the incident and the time that verbal notification was made to OES. The OES control number is provided to the caller by OES at the time verbal notification is made. Enter this control number in the space provided.

Block C: Provide information pertaining to the location where the release occurred. Include the street address, the city or community, the county and the zip code.

Block D: Provide information concerning the specific chemical that was released. Include the chemical or trade name and the Chemical Abstract Service (CAS) number. Check all categories that apply. Provide best available information on quantity, time and duration of the release.

Block E: Indicate all actions taken to respond to and contain the release as specified in 42 U.S.C. § 11004(c).

Block F: Check the categories that apply to the health effects that occurred or could result from the release. Provide an explanation or description of the effects in the space provided. Use Block H for additional comments/information if necessary to meet requirements specified in 42 U.S.C. § 11004(c).

Block G: Include information on the type of medical attention required for exposure to the chemical released. Indicate when and how this information was made available to individuals exposed and to medical personnel, if appropriate for the incident, as specified in 42 U.S.C. § 11004(c).

Block H: List any additional pertinent information.

Block I: Print or type the name of the facility representative submitting the report. Include the official signature and the date that the form was prepared.

MAIL THE COMPLETED REPORT TO:

**State Emergency Response Commission (SERC)
Attn: Section 304 Reports
Hazardous Materials Unit
3650 Schriever Avenue
Mather, CA 95655**

NOTE: Authority cited: Sections 25503, 25503.1 and 25507.1, Health and Safety Code. Reference: Sections 25503(b)(4), 25503.1, 25507.1, 25518 and 25520, Health and Safety Code.

APPENDIX I

SAMPLE ARCHAEOLOGY INVOICE

(FOR ARCHAEOLOGY ONLY)

Company Name

Address, telephone, fax

Date: Insert Date

To: Name of Resident Engineer
City of San Diego
Field Engineering Division
9485 Aero Drive
San Diego, CA 92123-1801

Project Name: Insert Project Name

SAP Number (WBS/IO/CC): Insert SAP Number

Drawing Number: Insert Drawing Number

Invoice period: Insert Date to Insert Date

Work Completed: Bid item Number – Description of Bid Item – Quantity – Unit Price– Amount

Detailed summary of work completed under this bid item: Insert detailed description of Work related to Archaeology Monitoring Bid item. See Note 1 below.

Summary of charges:

Description of Services	Name	Start Date	End Date	Total Hours	Hourly Rate	Amount
Field Archaeologist	Joe Smith	8/29/2011	9/2/2011	40	\$84	\$3,360
Laboratory Assistant	Jane Doe	8/29/2011	9/2/2011	2	\$30	\$60
Subtotal						\$3,420

Work Completed: Bid item Number – Description of Bid Item – Quantity – Unit Price– Amount

Detailed summary of work completed under this bid item: Insert detailed description of Work related to Archaeology Curation/Discovery Bid item. See Note 2 below.

Summary of charges:

Description of Services	Where work occurred (onsite vs offsite/lab)	Name	Start Date	End Date	Total Hours	Hourly Rate	Amount
Field Archaeologist		Joe Smith	8/29/2011	9/2/2011	40	\$84	\$3,360
Laboratory Assistant		Jane Doe	8/29/2011	9/2/2011	2	\$30	\$60
Subtotal							\$3,420

Total this invoice: \$ _____

Total invoiced to date: \$ _____

Note 1:

For monitoring related bid items or work please include summary of construction work that was monitored from Station to Station, Native American monitors present, MMC coordination, status and nature of monitoring and if any discoveries were made.

Note 2:

For curation/discovery related bid items or work completed as part of a discovery and curation process, the PI must provide a response to the following questions along with the invoice:

1. Preliminary results of testing including tentative recommendations regarding eligibility for listing in the California Register of Historical Resources (California Register).
 - a. Please briefly describe your application (consideration) of all four California Register criteria.
 - b. If the resource is eligible under Criterion D, please define the important information that may be present.
 - c. Were specialized studies performed? How many personnel were required? How many Native American monitors were present?
 - d. What is the age of the resource?
 - e. Please define types of artifacts to be collected and curated, including quantity of boxes to be submitted to the San Diego Archaeological Center (SDAC). How many personnel were required? How many Native American monitors were present?
2. Preliminary results of data recovery and a definition of the size of the representative sample.
 - a. Were specialized studies performed? Please define types of artifacts to be collected and curated, including quantity of boxes to be submitted to the SDAC. How many personnel were required? How many Native American monitors were present?
3. What resources were discovered during monitoring?
4. What is the landform context and what is the integrity of the resources?
5. What additional studies are necessary?
6. Based on application of the California Register criteria, what is the significance of the resources?
 - a. If the resource is eligible for the California Register, can the resource be avoided by construction?
 - b. If not, what treatment (mitigation) measures are proposed? Please define data to be recovered (if necessary) and what material will be submitted to the SDAC for curation. Are any specialized studies proposed?

(After the first invoice, not all the above information needs to be re-stated, just revise as applicable).

APPENDIX J

SAMPLE OF PUBLIC NOTICES



CONSTRUCTION NOTICE

PROJECT TITLE

Work on your street will begin within one week to replace the existing water mains servicing your community.

The work will consist of:

- Saw-cutting and trench work on Ingulf Street from Morena Boulevard to Galveston Street to install new water mains, water laterals and fire hydrants.
• Streets where trenching takes place will be resurfaced and curb ramps will be upgraded to facilitate access for persons with disabilities where required.
• This work is anticipated to be complete in your community by December 2016.

How your neighborhood may be impacted:

- Water service to some properties during construction will be provided by a two-inch highline pipe that will run along the curb. To report a highline leak call 619-515-3525.
• Temporary water service disruptions are planned. If planned disruptions impact your property, you will receive advance notice.
• Parking restrictions will exist because of the presence of construction equipment and materials.
• "No Parking" signs will be displayed 72 hours in advance of the work.
• Cars parked in violation of signs will be TOWED.

Hours and Days of Operation:

Monday through Friday X:XX AM to X:XX PM.

City of San Diego Contractor:

Company Name, XXX-XXX-XXXX



CONSTRUCTION NOTICE

PROJECT TITLE

Work on your street will begin within one week to replace the existing water mains servicing your community.

The work will consist of:

- Saw-cutting and trench work on Ingulf Street from Morena Boulevard to Galveston Street to install new water mains, water laterals and fire hydrants.
• Streets where trenching takes place will be resurfaced and curb ramps will be upgraded to facilitate access for persons with disabilities where required.
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• Parking restrictions will exist because of the presence of construction equipment and materials.
• "No Parking" signs will be displayed 72 hours in advance of the work.
• Cars parked in violation of signs will be TOWED.

Hours and Days of Operation:

Monday through Friday X:XX AM to X:XX PM.

City of San Diego Contractor:

Company Name, XXX-XXX-XXXX

To contact the City of San Diego: SD Public Works 619-533-4207 | engineering@sandiego.gov | sandiego.gov/CIP

To contact the City of San Diego: SD Public Works 619-533-4207 | engineering@sandiego.gov | sandiego.gov/CIP

APPENDIX K

ADVANCED METERING INFRASTRUCTURE (AMI) DEVICE PROTECTION

Protecting AMI Devices in Meter Boxes and on Street Lights

The Public Utilities Department (PUD) has begun the installation of the Advanced Metering Infrastructure (AMI) technology as a new tool to enhance water meter reading accuracy and efficiency, customer service and billing, and to be used by individual accounts to better manage the efficient use of water. **All AMI devices shall be protected per Section 5-2, "Protection", of the 2015 Whitebook.**

AMI technology allows water meters to be read electronically rather than through direct visual inspection by PUD field staff. This will assist PUD staff and customers in managing unusual consumption patterns which could indicate leaks or meter tampering on a customer's property.

Three of the main components of an AMI system are the:

- A. Endpoints, see Photo 1:

Photo 1



B. AMI Antenna attached to Endpoint (antenna not always required), see Photo 2:

Photo 2



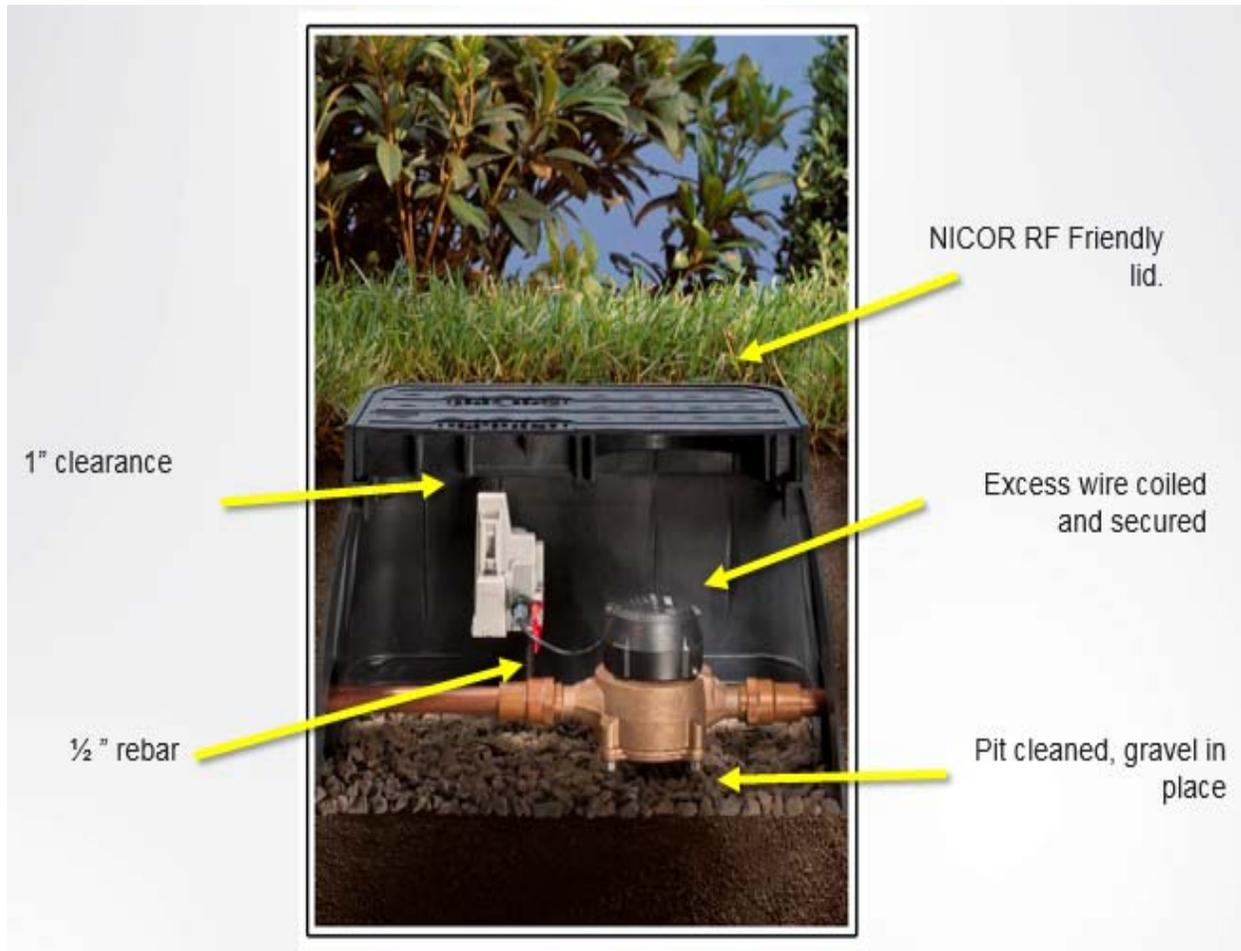
Network Devices, see Photo 3:

Photo 3



AMI endpoints transmit meter information to the AMI system and will soon be on the vast majority of meters in San Diego. These AMI devices provide interval consumption data to the PUD's Customer Support Division. If these devices are damaged or communication is interrupted, this Division will be alerted of the situation. The endpoints are installed in water meter boxes, coffins, and vaults adjacent to the meter. A separate flat round antenna may also be installed through the meter box lid. This antenna is connected to the endpoint via cable. The following proper installation shall be implemented when removing the lid to avoid damaging the antenna, cable, and/or endpoint. Photo 4 below demonstrates a diagram of the connection:

Photo 4



The AMI device ERT/Endpoint/Transmitter shall be positioned and installed as discussed in this Appendix. If the ERT/Endpoint/Transmitter is disturbed, it shall be re-installed and returned to its original installation with the end points pointed upwards as shown below in Photo 5.

The PUD's code compliance staff will issue citations and invoices to you for any damaged AMI devices that are not re-installed as discussed in the Contract Document

Photo 5 below shows a typical installation of an AMI endpoint on a water meter.

Photo 5

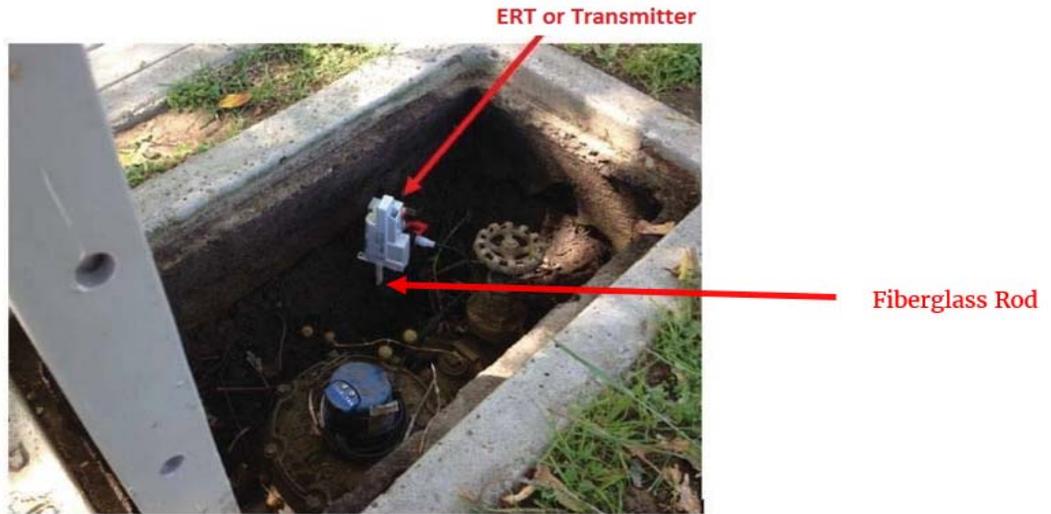


Photo 6 below is an example of disturbance that shall be avoided:

Photo 6



You are responsible when working in and around meter boxes. If you encounter these endpoints, use proper care and do not disconnect them from the registers on top of the water meter. If the lid has an antenna drilled through, do not change or tamper with the lid and inform the Resident Engineer immediately about the location of that lid. Refer to Photo 7 below:

Photo 7



Another component of the AMI system are the Network Devices. The Network Devices are strategically placed units (mainly on street light poles) that collect interval meter reading data from multiple meters for transmission to the Department Control Computer. **If you come across any of these devices on street lights that will be removed or replaced (refer to Photos 8 and 9 below), notify AMI Project Manager Arwa Sayed at (619) 362-0121 immediately.**

Photo 8 shows an installed network device on a street light. On the back of each Network Device is a sticker with contact information. See Photo 9. **Call PUD Water Emergency Repairs at 619-515-3525 if your work will impact these street lights.** These are assets that belong to the City of San Diego and you shall be responsible for any costs of disruption of this network.

Photo 8



Network Device

Photo 9



If you encounter any bad installations, disconnected/broken/buried endpoints, or inadvertently damage any AMI devices or cables, notify the Resident Engineer immediately. The Resident Engineer will then immediately contact the AMI Project Manager, Arwa Sayed, at (619) 362-0121.

ATTACHMENT F
INTENTIONALLY LEFT BLANK

ATTACHMENT G

CONTRACT AGREEMENT

CONTRACT AGREEMENT

CONSTRUCTION CONTRACT

This contract is made and entered into between THE CITY OF SAN DIEGO, a municipal corporation, herein called "City", and TC Construction Company, Inc., herein called "Contractor" for construction of **Mid City Pipeline Phase 2A**; Bid No. **K-18-1545-DBB-3**; in the amount of **Six Million One Hundred Eighty Six Thousand Seven Hundred Four Dollars and Zero Cents (\$6,186,704.00)**, which is comprised of the base bid.

IN CONSIDERATION of the payments to be made hereunder and the mutual undertakings of the parties hereto, City and Contractor agree as follows:

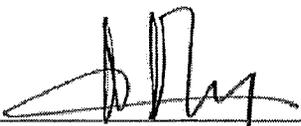
1. The following are incorporated into this contract as though fully set forth herein:
 - (a) The attached Faithful Performance and Payment Bonds.
 - (b) The attached Proposal included in the Bid documents by the Contractor.
 - (c) Reference Standards listed in the Instruction to Bidders and the Supplementary Special Provisions (SSP).
 - (d) Phase Funding Schedule Agreement.
 - (e) That certain documents entitled **Mid City Pipeline Phase 2A**, on file in the office of the Public Works Department as Document No. **B-17081** as well as all matters referenced therein.
2. The Contractor shall perform and be bound by all the terms and conditions of this contract and in strict conformity therewith shall perform and complete in a good and workmanlike manner **Mid City Pipeline Phase 2A**; Bid No. **K-18-1545-DBB-3**, San Diego, California.
3. For such performances, the City shall pay to Contractor the amounts set forth at the times and in the manner and with such additions or deductions as are provided for in this contract, and the Contractor shall accept such payment in full satisfaction of all claims incident to such performances.
4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
5. This contract is effective as of the date that the Mayor or designee signs the agreement.

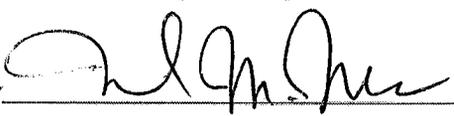
CONTRACT AGREEMENT (continued)

IN WITNESS WHEREOF, this Agreement is signed by the City of San Diego, acting by and through its Mayor or designee, pursuant to Municipal Code §22.3102 authorizing such execution.

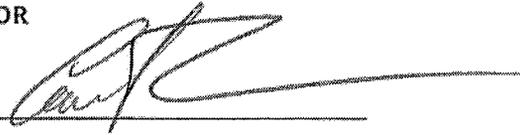
THE CITY OF SAN DIEGO

APPROVED AS TO FORM

By 
Print Name: Albert P. Rechany
Deputy Director
Public Works Department
Date: 03/20/2018

Mara W. Elliott, City Attorney
By 
Print Name: Mark H. Valencia
Deputy City Attorney
Date: 3/23/18

CONTRACTOR

By 
Print Name: AUSTIN CAMERON
Title: PRESIDENT
Date: 1/18/2018

City of San Diego License No.: B1987004773

State Contractor's License No.: 402459

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION NUMBER: 1000003132

CERTIFICATIONS AND FORMS

The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certifications, forms and affidavits submitted as part of this bid are true and correct

Bidder's General Information

To the City of San Diego:

Pursuant to "Notice Inviting Bids", specifications, and requirements on file with the City Clerk, and subject to all provisions of the Charter and Ordinances of the City of San Diego and applicable laws and regulations of the United States and the State of California, the undersigned hereby proposes to furnish to the City of San Diego, complete at the prices stated herein, the items or services hereinafter mentioned. The undersigned further warrants that this bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

The undersigned bidder(s) further warrants that bidder(s) has thoroughly examined and understands the entire Contract Documents (plans and specifications) and the Bidding Documents therefore, and that by submitting said Bidding Documents as its bid proposal, bidder(s) acknowledges and is bound by the entire Contract Documents, including any addenda issued thereto, as such Contract Documents incorporated by reference in the Bidding Documents.

**NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID UNDER 23
UNITED STATES CODE 112 AND PUBLIC CONTRACT CODE 7106**

State of California

County of San Diego

The bidder, being first duly sworn, deposes and says that he or she is authorized by the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

CONTRACTOR CERTIFICATION

DRUG-FREE WORKPLACE

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-17 regarding Drug-Free Workplace as outlined in the WHITEBOOK, Section 7-13.3, "Drug-Free Workplace", of the project specifications, and that;

This company_has in place a drug-free workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of subdivisions a) through c) of the policy as outlined.

CONTRACTOR CERTIFICATION

AMERICAN WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-4 regarding the American With Disabilities Act (ADA) outlined in the WHITEBOOK, Section 7-13.2, "American With Disabilities Act", of the project specifications, and that:

This company has in place workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of the policy as outlined.

CONTRACTOR CERTIFICATION

CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE

I declare under penalty of perjury that I am authorized to make this certification on behalf of the company submitting this bid/proposal, that as Contractor, I am familiar with the requirements of City of San Diego Municipal Code § 22.3004 regarding Contractor Standards as outlined in the WHITEBOOK, Section 7-13.4, ("Contractor Standards"), of the project specifications, and that Contractor has complied with those requirements.

I further certify that each of the Contractor's subcontractors whose subcontracts are greater than \$50,000 in value has completed a Pledge of Compliance attesting under penalty of perjury of having complied with City of San Diego Municipal Code § 22.3004.

CONTRACTOR CERTIFICATION

Equal Benefits Ordinance Certification

I declare under penalty of perjury that I am familiar with the requirements of and in compliance with the City of San Diego Municipal Code § 22.4300 regarding Equal Benefits Ordinance.

LIST OF SUBCONTRACTORS

***** PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY *** TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY Y*** SEE INSTRUCTIONS TO BIDDERS, FOR FURTHER INFORMATION**

In accordance with the requirements of the "Subletting and Subcontracting Fair Practices Act", Section 4100, of the California Public Contract Code (PCC), the Bidder is to list below the name, address and license number of each Subcontractor who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement, in an amount of or in excess of 0.5% of the Contractor's total Bid. Failure to comply with this requirement may result in the Bid being rejected as non-responsive. The Contractor is to list only one Subcontractor for each portion of the Work. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percentage of the Work to be performed with the Bidder's own forces. The Bidder is to also list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which the Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB [ⓐ]	WHERE CERTIFIED [ⓑ]	CHECK IF JOINT VENTURE PARTNERSHIP
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____							
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____							

- ⓐ As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):
- | | | | |
|---|--------|--|---------|
| Certified Minority Business Enterprise | MBE | Certified Woman Business Enterprise | WBE |
| Certified Disadvantaged Business Enterprise | DBE | Certified Disabled Veteran Business Enterprise | DVBE |
| Other Business Enterprise | OBE | Certified Emerging Local Business Enterprise | ELBE |
| Certified Small Local Business Enterprise | SLBE | Small Disadvantaged Business | SDB |
| Woman-Owned Small Business | WoSB | HUBZone Business | HUBZone |
| Service-Disabled Veteran Owned Small Business | SDVOSB | | |
- ⓑ As appropriate, Bidder shall indicate if Subcontractor is certified by:
- | | | | |
|--|--------|--|----------|
| City of San Diego | CITY | State of California Department of Transportation | CALTRANS |
| California Public Utilities Commission | CPUC | | |
| State of California's Department of General Services | CADoGS | City of Los Angeles | LA |
| State of California | CA | U.S. Small Business Administration | SBA |

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

NAMED EQUIPMENT/MATERIAL SUPPLIER LIST

***** PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY *** TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY *** SEE INSTRUCTIONS TO BIDDERS FOR FURTHER INFORMATION**

NAME, ADDRESS AND TELEPHONE NUMBER OF VENDOR/SUPPLIER	MATERIALS OR SUPPLIES	DOLLAR VALUE OF MATERIAL OR SUPPLIES	SUPPLIER (Yes/No)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB ^①	WHERE CERTIFIED ^②
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____						
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____						

① As appropriate, Bidder shall identify Vendor/Supplier as one of the following and shall include a valid proof of certification (except for OBE,SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC		
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

AFFIDAVIT OF DISPOSAL

(To be submitted upon completion of Construction pursuant to the contracts Certificate of Completion)

WHEREAS, on the _____ DAY OF _____, 2_____ the undersigned entered into and executed a contract with the City of San Diego, a municipal corporation, for:

MID CITY PIPELINE PHASE 2A

(Name of Project or Task)

as particularly described in said contract and identified as Bid No. **K-18-1545-DBB-3**; SAP No. (WBS/IO/CC) **B-17081**; and **WHEREAS**, the specification of said contract requires the Contractor to affirm that "all brush, trash, debris, and surplus materials resulting from this project have been disposed of in a legal manner"; and **WHEREAS**, said contract has been completed and all surplus materials disposed of:

NOW, THEREFORE, in consideration of the final payment by the City of San Diego to said Contractor under the terms of said contract, the undersigned Contractor, does hereby affirm that all surplus materials as described in said contract have been disposed of at the following location(s)

and that they have been disposed of according to all applicable laws and regulations.

Dated this _____ DAY OF _____, _____.

By: _____
Contractor

ATTEST:

State of _____ County of _____

On this _____ DAY OF _____, 2_____, before the undersigned, a Notary Public in and for said County and State, duly commissioned and sworn, personally appeared _____ known to me to be the _____ Contractor named in the foregoing Release, and whose name is subscribed thereto, and acknowledged to me that said Contractor executed the said Release.

Notary Public in and for said County and State

ELECTRONICALLY SUBMITTED FORMS

THE FOLLOWING FORMS MUST BE SUBMITTED IN PDF FORMAT WITH BID SUBMISSION

The following forms are to be completed by the bidder and submitted (uploaded) electronically with the bid in PlanetBids.

- A. BID BOND – See Instructions to Bidders, Bidders Guarantee of Good Faith (Bid Security) for further instructions**
- B. CONTRACTOR’S CERTIFICATION OF PENDING ACTIONS**

Bids will not be accepted until ALL the above-named forms are submitted as part of the bid submittal

BID BOND

**See Instructions to Bidders, Bidder Guarantee of Good Faith
(Bid Security)**

KNOW ALL MEN BY THESE PRESENTS,

That TC Construction Company, Inc. as Principal, and
Liberty Mutual Insurance Company as Surety, are
held and firmly bound unto The City of San Diego hereinafter called "OWNER," in the sum of **10% OF
THE TOTAL BID AMOUNT** for the payment of which sum, well and truly to be made, we bind
ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly
by these presents.

WHEREAS, said Principal has submitted a Bid to said OWNER to perform the WORK required under
the bidding schedule(s) of the OWNER's Contract Documents entitled

Mid City Pipeline Phase 2A; Bid No. K-18-1545-DBB-3

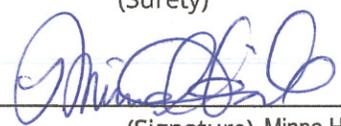
NOW THEREFORE, if said Principal is awarded a contract by said OWNER and, within the time and in
the manner required in the "Notice Inviting Bids" enters into a written Agreement on the form of
agreement bound with said Contract Documents, furnishes the required certificates of insurance, and
furnishes the required Performance Bond and Payment Bond, then this obligation shall be null and
void, otherwise it shall remain in full force and effect. In the event suit is brought upon this bond by
said OWNER and OWNER prevails, said Surety shall pay all costs incurred by said OWNER in such suit,
including a reasonable attorney's fee to be fixed by the court.

SIGNED AND SEALED, this 27th day of November, 2017

TC Construction Company, Inc. (SEAL)
(Principal)

Liberty Mutual Insurance Company (SEAL)
(Surety)

By: 
(Signature) Austin Cameron, President

By: 
(Signature) Minna Huovila, Attorney-in-Fact

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California)
County of San Diego)
On December 11, 2017 before me, Sandra Weeks, Notary Public,
Date Here Insert Name and Title of the Officer
personally appeared Austin Cameron
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.



Signature Sandra Weeks
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Bid Bond
Document Date: _____ Number of Pages: 1
Signer(s) Other Than Named Above: N/A

Capacity(ies) Claimed by Signer(s)

Signer's Name: Austin Cameron
 Corporate Officer — Title(s): President
 Partner — Limited General
 Individual Attorney in Fact
 Trustee Guardian or Conservator
 Other: _____

Signer's Name: _____
 Corporate Officer — Title(s): _____
 Partner — Limited General
 Individual Attorney in Fact
 Trustee Guardian or Conservator
 Other: _____

Signer Is Representing: TC Construction Co, Inc.

Signer Is Representing: _____

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT
CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

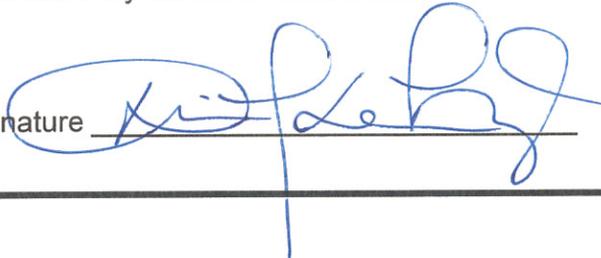
State of California
County of San Diego)

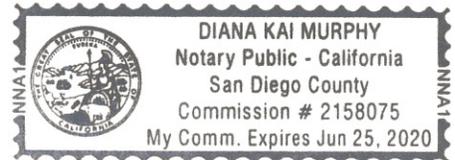
On November 27, 2017 before me, Diana Kai Murphy, Notary Public
(insert name and title of the officer)

personally appeared Minna Huovila,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are
subscribed to the within instrument and acknowledged to me that he/she/they executed the same in
his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the
person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing
paragraph is true and correct.

WITNESS my hand and official seal.

Signature  (Seal)



THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Certificate No. 7552520

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company West American Insurance Company

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Bradley R. Orr; Dale G. Harshaw; Geoffrey Shelton; John R. Qualin; Kyle King; Minna Huovila; Tara Bacon

all of the city of San Diego, state of CA each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 22nd day of November, 2016.



The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
West American Insurance Company

By: David M. Carey
David M. Carey, Assistant Secretary

STATE OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 22nd day of November, 2016, before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.



COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2017
Member, Pennsylvania Association of Notaries

By: Teresa Pastella
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS – Section 12. Power of Attorney. Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts – SECTION 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 27th day of November, 2017.



By: Renee C. Llewellyn
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

ENGINEER OF WORK

The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineer:

Michael Pollard
1) Registered Engineer

11/28/17
Date

Seal:



Brian Vitelle
2) For City Engineer

11/28/17
Date

Seal:



A. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

B. BIDDER'S QUESTIONS

Q1. Because very prescriptive and complex nature of the microtunneling specification we ask that the City delay the question due date by 1 week.

A1. Bid opening has been extended.

Q2. Because very prescriptive and complex nature of the microtunneling specification we ask that the City delay the bid by 1 week.

A2. Bid opening has been extended.

Q3. Will the City consider any other method of tunneling besides microtunneling?

A3. Yes, see addendum A questions and answers.

Q4. Will the City consider the contractor to open cut in place of microtunneling?

A4. No.

Q5. There are a number of tests that should be performed to see if a bentonite slurry is needed for microtunneling. Has the City performed any of these tests? If so, will the City provide potential bidders with the results of said test?

A5. Bid as specified.

Q6. Viscosity is one, but not the main determining factor bentonite slurry effectiveness. How did the City determine that 55 sec/quart was adequate?

A6. Bid as specified.

- Q7. Please confirm that the City will require all microtunneling contractors to use bentonite slurry, regardless of MTBM manufacture.
- A7. Yes, confirmed.
- Q8. Please confirm that the City is requiring the use of a D mode MTBM for this project.
- A8. D mode MTBM is recommended but not required.
- Q9. To maintain the 3 psi above the groundwater table during the shutdown time, will require an operator to monitor the pressure 24/7 and run a compressor and other equipment to add bentonite if necessary into the D mode chamber. Will this be allowed?
- A9. This will be allowed if necessary.
- Q10. Due to the total length of the tunnel being only 62 LF the allowable tolerances are very small. We respectfully ask the City only enforce the horizontal alignment of +/-3 inches and vertical alignment of +/- 2 inches.
- A10. This is acceptable.
- Q11. Has the City and or the Engineer conducted systematic surface settlement Calculation for the trenchless Crossing? If so, what was the overcut used in this calculation? What was the lubrication fill % of the overcut area used in this calculation? What was the anticipated Face Loss used in this Calculations? What was the friction angle used in this calculation? Would the Owner consider sharing the calculations with the bidders?
- A11. Bid as specified.
- Q12. A filter cake is not always attainable just by using bentonite in the slurry. The ground also needs to be accepting of the filter cake formation. Has the City performed any sieve analysis within the tunnel zone?
- A12. No sieve analysis within the tunnel zone has been performed.

Q13. Has the City performed a pump or permeability test within the tunnel zone?

A13. Bid as specified.

Q14. Will the City provide a bid item for removal or abandonment of the tunnel?

A14. No.

Q15. The work area shown on T-8 for the microtunneling jacking shaft work area is approximately 65' x 15' when you account for the power lines. This is not a large enough work area for a microtunneling project. We respectfully ask that the City revise the drawings to allow a larger work area.

A15. Bid as specified.

Q16. Has the City or Engineer hired a trenchless consultant for this project?

A16. Yes

Q17. What is the allowable overcut for the trenchless crossing?

A17. 1 inch is recommended.

C. SUPPLEMENTARY SPECIAL PROVISIONS

1. To Attachment E, Technicals, Division 02, SITEWORK, Section 02445, Installation of Carrier Pipe in Steel Casing Pipe, page 114 through page 130, **DELETE** in its entirety and **SUBSTITUTE** with pages 6 through 23 of this Addendum.
2. To Attachment E, Technicals, Division 16, ELECTRICAL, Section 16640, Cathodic Protection System, page 248 through page 258, **DELETE** in its entirety and **SUBSTITUTE** with pages 24 through 42 of this Addendum.

James Nagelvoort, Director
Public Works Department

Dated: *November 28, 2017*
San Diego, California

JN / RWB / cc

SECTION 02445

INSTALLATION OF CARRIER PIPE IN STEEL CASING

PART 1 -- GENERAL

1.1 SCOPE OF WORK

- A. This section specifies requirements for the installation of the final carrier pipe and fiber optic conduit(s) inside a steel casing pipe; including requirements for the design of casing spacers/supports, bulkheads, concrete mixes and placement of backfill concrete.
- B. Product carrier pipes are to be installed either by pipe transport equipment (pipemobile), casing spacers or a railing support system.
- C. Requirements for microtunneling are specified in Section 02443.
- D. Requirements for fiber optic conduit are specified in Section 700-1.5.

1.2 RELATED NON-SSPWC SECTIONS:

- A. Section 02443 Microtunneling

1.3 REFERENCE CODES AND STANDARDS

- A. Unless otherwise indicated, the current editions of the following specifications and standards apply to the Work of this Section.
- B. American Concrete Institute (ACI):
 - 1. 304, Placing Concrete by Pumping Methods.
 - 2. 523, Guide for Cast-in-Place Low Density Cellular Concrete
- C. American Society for Testing and Materials (ASTM):
 - 1. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 3. C109, Standard Test Method for Compressive Strength of Hydraulic Cement

Mortars (Using 2-in. or [50-mm] Cube Specimens).

4. C138, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
 5. C150, Standard Specification for Portland Cement.
 6. C191, Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle
 7. C266, Standard Test Method for Time of Setting of Hydraulic-Cement Paste by Gillmore Needles
 8. C495, Standard Test Method for Compressive Strength of Lightweight Insulating Concrete.
 9. C567, Standard Test Method for Determining Density of Structural Lightweight Concrete.
 10. C796, Standard Test Method for Foaming Agents for Use in Producing Cellular Concrete with Preformed Foam.
 11. C869, Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete.
 12. C939, Standard Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method)
 13. D6103, Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)
- D. AWWA Manual of Water Supply Practices – M9. "Concrete Pressure Pipe".
- E. "Greenbook", Standard Specifications for Public Works Construction (SSPWC), and per the latest revisions by City of San Diego White Book.

1.4 DEFINITIONS

- A. Backfill Concrete: Cementitious material used to fill the void space between the carrier pipe and the initial ground support made of steel casing pipe.
- B. Backfill Grouting: The injection of backfill concrete to fill the void space between the carrier pipe and the initial ground support made of steel casing pipe.
- C. Cellular Concrete: A lightweight cementitious material that contains stable air or gas cells as a preformed foam uniformly distributed throughout the mixture, designed to fill the

void space between the carrier pipe and the initial ground support made of steel casing pipe.

- D. Pit: A vertical opening where the depth of the excavation is less than the long dimensions of the excavation. The word "pit" and "shaft" are used interchangeably in this specification.
- E. Shaft: A vertical opening where the depth of the excavation is more than the long dimensions of the excavation. The word "pit" and "shaft" are used interchangeably in this specification.
- F. Slurry Concrete: A type of backfill concrete as specified herein.

1.5 DESIGN REQUIREMENTS

- A. Carrier pipe for crossing shall be made specifically for the underground installation method specified herein.
- B. Carrier pipe and pipe specials shall be installed within the casing pipe with a minimum clearance:
 - 1. Between steel casing pipe and carrier pipe = 6 inches; and
 - 2. Between steel casing pipe and outside of fiber optics product pipe = 2 inches.

as measured between the inside casing pipe wall and the furthest projection of the product pipe's outer sidewall or bell or as indicated.

The CONTRACTOR shall include additional allowances for pipe transporting equipment, carrier pipe support and adjustment in the carrier pipe's line and grade in the event that the casing pipe is installed out of the line-and-grade tolerances specified in Section 02443.

- C. The length of each section of the carrier pipe shall be as determined by the CONTRACTOR and shall not exceed the clearance between pit/shaft excavation support members measured parallel to the tunnel.
- D. Installation tolerances of the carrier pipe, as measured from the design alignment shown on the Drawings - Refer to construction tolerances described in Section 02443 Part 1.7.
- E. Backfill Concrete
 - 1. Design grout mixes with appropriate properties to fully serve their intended purpose.
 - 2. Completely fill in all annular gap and to seal all the external gap space

between pipe joints for protection.

3. Minimum compressive strength tested at 28-day shall be as follows:
 - a. During the submittal phase - 500 psi for any trial design mix(es) to be approved by the City; and
 - b. During construction phase – see Part 3.4.
4. All testing shall be performed in a certified laboratory acceptable to the City.

1.6 SUBMITTALS

- A. Working Drawings: Cross sections and profile drawings indicating relative arrangement of and dimensioned clearances between the as surveyed locations of the casing pipe, carrier pipe, fiber optics product pipes, casing spacers/supports, concrete/grout pipes, grout ports, termination and intermediate bulkheads, and other equipment and materials used in the performance of the work.
- B. Carrier/Product Pipe Shop Drawings and Methods Statements:
 1. Manufacturer's written recommendations for shipping, handling, installing the carrier/product pipe, and backfill grouting.
 2. Carrier pipe for underground application, including any design modifications made and details.
 3. Methods and procedures for installing carrier pipe and the fiber optic conduits inside the casing pipe to comply with the line and grade requirements and to meet the tolerances and minimum clearances specified herein. When applicable, submit the design of the casing spaces, railing support system, or pipe transporting equipment or "pipemobile".
 4. Methods and procedures for installing carrier/product pipe and fiber optic conduits inside the casing pipe without any damages to the joint(s) and to ensure a watertight connection.
 5. Certification from carrier/product pipe manufacturer stating that the pipes and joints are designed or protected to withstand heat of hydration from backfill grouting, and loads from installation and backfill grouting, without damage. Define maximum allowable injection grouting pressure.
 6. Methods for cleaning and clearing casing pipe of all obstructions, foreign materials and water leakage before and during carrier pipe installation.
 7. Methods for preventing carrier/product pipes from rotating during installation and floating within the casing pipe during backfill grouting.

- C. Pips Spacers/Support Shop Drawings, Calculations, and Method Statement:
1. Manufacturer's technical literature and written assembly instructions.
 2. Calculations stamped and signed by the pipe spacer/support manufacturer's or CONTRACTOR's design engineer demonstrating the spacers are designed to withstand thrust force and frictional forces during carrier/product pipe installation, buoyancy, backfill grouting pressure, heat of hydration, and construction loads, and have no adverse effect on the pipe.
 3. Calculations stamped and signed by the designer of the carrier/product pipe manufacturer that the pipe and joint are designed to withstand the maximum thrust force and construction misalignment during carrier pipe installation.
 4. Shop drawings showing pipe spacer/support spacing, dimensions, configurations, joints, accessories and details.
- D. Provide manufacturer's technical information and written recommendations for all materials incorporated into the work.
- E. Backfill Concrete or grouting Working Drawings and Methods Statement:
1. Design details for termination and intermediate bulkheads, means and methods for end seal installation and construction, including means to remove all trapped groundwater in the annular space.
 2. Patterns and details for staging, sequencing, performing and monitoring the backfilling operation. For each stage of placement operation, include the means and methods for advancing concrete/grout pipes, placement of injection holes, grout ports, collecting and disposing of excess and waste material, collecting and disposing of water resulting from operations.
 3. Layout and description of equipment and facilities including:
 - a. Supply equipment.
 - b. Agitators or holding tanks.
 - c. Mixers.
 - d. Pumps.
 - e. Delivery piping and manifolds.
 - f. Hookup details including valves, packers, and gauges.

4. Means and methods for:
 - a. Proportioning and mixing in the field.
 - b. Measuring injection pressure, quantity, and injection rate.
 - c. Maintaining injection pressure below specified limits.
 - d. Sequencing, staging of the work and establishing basis and threshold values for modifying mixes.
 - e. Concrete/grout placement setup, staging and procedures to ensure no voids are left behind.
 - f. Furnishing, preparing, and plugging or patching injection holes
 - g. Single or Multiple stages/lifts
 - h. Estimated volume of material to be placed each lift/stage and verification in the field.
 - i. Corrective actions when voids or leakage are found in the backfill concrete

F. Qualifications for the following:

1. CONTRACTOR's design engineer.
2. Superintendent in charge of carrier pipe installation.
3. Backfill concrete installer.
4. Testing Laboratory

G. Product Data:

1. Proposed mix, wet, dry densities and viscosity.
2. Certified test results including unit weight, total air content, unconfined compressive strength at varies elapsed times of the proposed mix from an independent approved laboratory.
3. Initial set time of the grout and the working time before a 15 percent change in density or viscosity occurs.

4. Ability to be pumped for long distance.
 5. Mixing and pressure control valves.
 6. Additional information required for cellular concrete:
 - a. Type, brand, source, and amounts of cement, fly ash, admixtures, foaming agent, and other additives.
 - b. Cellular concrete foam generator, mixing plant, pump, control valve and pressure gauge assembly at the point of injection.
 - c. Method for transporting and placing cellular concrete minimizing potential variations in the grout properties.
 - d. Permeability of finished product
- H. Daily production records submitted no later than the beginning of the following work day.
1. Carrier/product pipe installation records shall list footage of carrier/product pipes installed, joint testing results, line and grade, and maximum installation load.
 2. Records of concrete placement including volume placed, grout pipe installation schedule, stationing of placement, injection locations, maximum injection pressure, time of placement, concrete test results as required herein, and designation of cylinder samples prepared that day.
- I. Measures to resolve problems caused by out-of-tolerance casing pipe.
- J. Provide minimum five work days advance notification of meeting date and time for any preconstruction meeting.
- 1.7 QUALITY ASSURANCE
- A. Qualifications:
1. Backfill concrete installer specializing in the supply and placement of backfill concrete shall be capable of developing a mix design, batching, mixing, handling and placing backfill concrete in underground conditions.
 2. CONTRACTOR's design engineer shall be a Civil or Structural Engineer registered in California. All work submitted under this section shall be prepared, signed and stamped by Contractor's design engineer. For use of cellular grout, the design engineer shall confirm that number of lifts, pumping pressure, and rate of injection will not collapse the foam.

3. Superintendent in charge of pipe installation shall be in responsible charge of similar work on a minimum of two projects of equivalent size and complexity within the past 5 years.

B. Cellular concrete:

1. Shall be designed in accordance with the requirements of this Section and ACI 523.1 and shall comply with ASTM C869.
2. Proposed testing for each mix shall be as follows:
 - a. Prepare and test samples for 7-day, and 28-day unconfined compressive strength tests according to ASTM C31 for cylinders or ASTM C109 for cubes.
 - b. Two sets of three samples each shall be made from each proposed cellular concrete mix. One set shall be tested at an age of 7 days, and another set shall be tested at an age of 28 days. Cellular concrete test specimens shall be made, cured, stored, and tested in accordance with ASTM C495.
 - c. Determination of total air content of each proposed cellular concrete mix in accordance with ASTM C796. Wet density tests shall be made prior to the addition of the foaming agent and at the point of placement.
 - d. Determination of unit weight of each proposed cellular concrete mix in accordance with ASTM C567.
 - e. Determine the viscosity of the proposed cellular concrete mix in accordance with
 - (1) If fine aggregate is included in the mix – ASTM D6103
 - (2) If no aggregate is included in the mix – ASTM C939

1.8 PRECONSTRUCTION MEETING

- A. Hold a preconstruction meeting at least five work days but not more than 30 work days prior to commencing each of the following:
 1. Transport and installation of the carrier pipe.
 2. Construction stages
 3. Placement of backfill concrete
 4. Carrier/product pipe and joint testing requirements.

- B. Review and discuss the following items at the meetings:
 - 1. Results of the as-built survey of the steel casing, and necessary modifications have to be made for line and grade adjustments.
 - 2. CONTRACTOR's proposed carrier/product pipe support, cathodic protection, pressure test set up and procedure for pipes to be installed inside the steel casing.
 - 3. Construction methods, constraints and issues overview.
 - 4. Equipment operating parameters.
 - 5. Review safety procedures as described in the CONTRACTOR's health and safety plan.
 - 6. Quality control procedures and quality assurance requirements.
 - 7. Field Testing and reporting requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Water: Potable, and free from deleterious amounts of alkali, acid, organic materials, or other impurities that would adversely affect the setting time, strength, durability, or other quality of the backfill concrete. For cellular concrete, if water is used to pre-form the foam, it shall not exceed 80 degrees Fahrenheit (°F).
- B. Cement: Type II and conform to ASTM C150. Minimum 4 sacks of cement per batch for backfill.
- C. Slurry concrete – Per SSPWC 450-C-2000 design mix per Table 201-1.1.2(A).
- D. Cellular concrete shall be lightweight hardened cementitious material made from the combination of concrete and a foaming agent with an oven-dried minimum unconfined compressive strength listed in Part 1.5.E.
 - 1. Shall be designed in accordance with the requirements of this section and ACI 523.1.
 - 2. Cement: Conform to the requirements of ASTM C150.
 - 3. Fly Ash:
 - a. Class "C" or "F" fly ash, if used, shall conform to 201-1.2.5.3 in the

Greenbook.

- b. Use of fly ash limited to 20 percent by weight of the total cementitious material in the mix design.
 4. Sand: Gradation shall comply with SSPWC 200-1.5.3 or per manufacturer's written recommendations.
 5. Admixtures: Admixtures, may only be used when specifically approved by the foaming agent supplier in writing.
 6. Foaming Agent:
 - a. Foam shall be generated by combining controlled quantities of air, water, and foaming agent under pressure.
 - b. Foam shall retain its stability until the cement sets to form a self supporting matrix.
 - c. Foaming agent shall comply with ASTM C 869 when tested in accordance with ASTM C 796. The type and manufacturer shall be:
 - (1) Mearl Geofoam Liquid Concentrate manufactured by The Mearl Corporation, Roselle Park, NJ;
 - (2) Foam Liquid Concentrate manufactured by Cellufoam Concrete Systems;
 - (3) Elastizell EF, Foam Liquid Concentrate manufactured by Elastizell Corporation of America;
 - (4) Or approved equal.
- E. Casing spacers:
1. Longitudinal separation between spacers, when installed on the assembled carrier pipe, shall not exceed the lesser of 8 feet or carrier pipe manufacturer's recommendation, and shall be placed within 2 feet on each side of the coupling or joint. Provide a minimum of 3 casing spacers per pipe length.
 2. Design with a minimum factor of safety of 2.0 against all construction loads.
 3. Casing spacers shall be designed without a riser at crown (12 o'clock) and a leg at invert (6 o'clock), and shall be symmetrical about the vertical axis.
 4. Runner (legs) shall be made with low sliding friction material such as Ultra High

Molecular Weight (UHMW) to allow long distance installation.

5. Casing spacers shall provide electrical isolation of the carrier pipe from the steel casing pipe.
6. Casing spacers shall be non-conductive and sized for the carrier pipe to be installed within the specified line and grade tolerances.
7. Casing spacers shall be designed and installed to facilitate installation of concrete placement pipes and to ensure backfill concrete completely fills the void space between the casing pipe and the carrier pipe.
8. Casing spacers shall incorporate the routing of the fiber optic conduits.
9. Casing spacers shall not deform or become damaged from the heat of hydration of the backfill.
10. Casing spacers shall not damage the carrier pipe.
11. Casing spacers shall not be made of wood or wood skits.
12. Casing spacers shall be adjustable in height to allow for grade correction.

F. Carrier Pipe Support

1. Independent railing support system running the entire length of the casing pipe following the project line and grade and to support the full weight of the carrier/product pipe during transportation and backfill grouting operations.
2. Provisions protecting the carrier pipe from damages against sliding along the railing during placement.

G. Pipe end seals or end penetration seals for carrier pipe shall:

1. Provide electrical isolation
2. Completely span the annular gap opening from top to bottom
3. Resist backfill pressure
4. Resist heat of hydration.

2.2 EQUIPMENT

- A. Pipemobile – To be designed and submitted to the Engineer for approval.

- B. Cellular Concrete Foam Generator System:
 - 1. The batch system shall consist of a tank in which the foam liquid concentrate and water are first mixed. This dilute solution shall be discharged from either a pressurized tank or by means of a mechanical pump through a foam-making nozzle in which this solution is blended with compressed air in fixed proportions.
 - 2. The continuous generating system shall consist of a container, which continuously draws the concentrate directly from its shipping container, automatically blends it with water and compressed air in fixed proportions, and forms the stable micro- bubbled foam.
- C. Foam refining column or nozzle shall be calibrated for foam quality and discharge rate. The foam nozzle shall be timer-controlled to repetitively discharge any pre-selected quantity or to discharge continuously at a fixed rate.
- D. Mixers and Pumps: The rates of mixing and pumping shall be properly adjusted and a continuous flow of cellular concrete shall be obtained at the point of placement.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Confirm that the steel casing pipe installation are within the tolerances specified for the design line and grade by performing a field survey of the completed tunnel per Section 02443 Part 3.6 requirements. If any location is out of tolerance, obtain the ENGINEER's acceptance before carrier pipe installation. Implement approved measures to resolve problems caused by out-of-tolerance pipe as required by the ENGINEER at no additional cost to the CITY.
- B. Repair, stop and seal any water leakage of the casing pipe that does not meet the criteria specified in Section 02443.
- C. Perform work in accordance with the approved submittals.

3.2 CARRIER/PRODUCT PIPE INSTALLATION

- A. Immediately prior to moving a carrier pipe section into the casing pipe:
 - 1. Verify that sections can be installed at their project line and grade within the required tolerance and clearance, and without interference or damage.
 - 2. Clean casing pipe and carrier pipe.
 - 3. Remove all potential obstructions inside the casing pipe including grout port

assemblies and thrust rings for intermediate jacking stations.

- B. Acceptable methods of pipe installation: Install and position of each carrier pipe section to correct for any misalignment and to satisfy the minimum clearance requirements
1. Carry each pipe separately into the heading by a "pipemobile" and mate it with the section of pipe already installed; or
 2. Adjust casing spacers and push the carrier pipe into the casing pipe with a steady, non-jerking motion. The maximum installation force shall not exceed the manufacturer's recommendations or the allowable thrust load on the carrier pipe barrel and/or joints; or
 3. Install an invert railing system to true line and grade. Lay the carrier pipe supporting on top of the railing system and push the carrier pipe inside, while protecting the outside the carrier pipe from any damage.
 4. Install the fiber optics product pipe simultaneously with the carrier pipe or in a separate, independent operation. Fiber optics conduits shall be installed more or less in a straight line within the tunnel.
- C. Continually check for electrical isolation as carrier pipe is installed. If the casing becomes electrically shorted to the carrier, determine the cause and correct before continuing the installation of the carrier pipe at no additional expense to the city.
- D. Perform welding or qualification testing of the carrier/product pipe joints as required.

3.3 PLACING BACKFILL CONCRETE

- A. Fill the carrier pipe and fiber optic conduit with water if counter measures against buoyant from backfill grout is not addressed.
- B. Backfill grouting shall be performed through multiple horizontal grout/slickline pipes inserted into the void space between the carrier pipe and casing pipe. Terminate end of the grout pipes regularly along the length of the grout zone to allow an even distribution of the backfill concrete. If there were "high" points along the casing alignment, terminate additional grout pipes to the high points to minimize air pockets that may be trapped behind.
- C. Alternatively, perform backfill concrete placement through grout ports embedded along the carrier pipe.
- D. Prior to placing backfill concrete, build bulkheads at intermediate locations and install casing pipe end seals at the pit/shaft locations.
- E. Discharge end of the grout/slickline pipes shall always be embedded inside freshly

discharged concrete.

- F. Backfill grouting shall progress from the low end to the high end of the casing pipe, filling the entire void.
 - G. Apply safe grouting pressure per manufacturer's recommendations and as approved by the City.
 - H. Sloping joint for concrete placement in multiple lifts is acceptable as long as the advancing toe of the backfill concrete is always terminated at the end seal or any intermediate bulkheads.
 - I. Install an exhaust/vent in the crown on the high end of the casing pipe.
 - J. Install an injection pipe with shutoff valve on the low end of casing pipe.
 - K. Placement of cellular concrete shall be completed in multiple lifts/stages and in a short duration to prevent an excessive increase in density, unit weight, consistency and separation.
 - L. Employ the necessary means to ensure equal quantity of grout is placed on either side of the carrier pipe so as to avoid unbalanced loading.
 - M. Continuous placement until backfill concrete overflows from the vent at the high end of the casing pipe and all the following conditions are satisfied:
 - 1. At least 100% of the theoretical calculated backfill concrete volume has been placed.
 - 2. A minimum of 1.0 cubic yard of concrete overflows
 - 3. No more air bubbles stop flowing out from the vent hole.
 - 4. When all the required numbers of tested samples are taken.
 - 5. Exhausted grout at each vent is not less than 85 percent of the wet density of freshly injected grout when tested per ASTM C138.
 - 6. Exhausted grout at each vent is not less than 85 percent of the original viscosity of the freshly injected grout when tested per ASTM C939.
 - N. Close injection valve.
- 3.4 ERRANT GROUTING
- A. As soon as the following events occur, suspend grouting operations and notify the RESIDENT ENGINEER immediately:
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1. A service connection becomes loose;
2. A joint or bulkhead fails;
3. Grout flow, injection pressures, etcetera, deviate from approved submittals;
and
4. Leakage at pipe joint and at bulkhead; and
5. Pipe floatation

The Contractor shall meet with the Engineer as soon as practical after each grout placement and before the placement of the next reach of annular grout to discuss corrective measures or improvements in design or procedures.

3.5 FIELD QUALITY CONTROL

A. Completion of backfill grouting

1. To ensure backfill grouting is completed and no unfilled voids are left behind, the City will perform an inspection which will include opening of unhooked grout ports along the carrier pipe at a frequency of 1 per every 100 feet of installed pipe; where
 - a. No voids are to be found; and
 - b. No continuously leakage of water
2. Unsatisfied performance will require remedial grouting or other corrective actions.

B. Backfill

1. Field control tests of the backfill concrete shall be performed by the CONTRACTOR and the results submitted to the ENGINEER. The CONTRACTOR shall provide all equipment and personal and facilities necessary to perform these tests.
2. The following testing shall be performed for backfill concrete:
 - a. Unit Weight: Backfill concrete shall be tested for wet unit weight at the nearest location to the point of injection in accordance with ASTM C138 from each batch of concrete from which compression test cylinders are made. Unit weight of backfill concrete shall be within 5 percent of the unit weight of the approved mix design.
 - b. Viscosity: Backfill concrete shall be tested for viscosity at the nearest location

to the point of injection in accordance with ASTM C939 from each batch of concrete from which compression test cylinders are made. Viscosity shall be within 5 percent of the approved mix design.

- c. Compression Test Cylinders: Compression test cylinders shall be cast from each load, after every change in mix design, and at a frequency of not less than once per 20 cubic yard material placed or every 50-ft of grout placement. Each test cylinder shall be 6-inch by 12-inch. Test cylinders shall be sampled and made in the field, cured and stored in accordance with ASTM C31.

(1) Sampling Locations:

- (a) Taken from the concrete delivery truck – collect a set of three test cylinders; and
- (b) Taken from a system of valves in the line transporting the backfill concrete, which will allow for collection of test specimens at the nearest location to the point of injection without disconnecting the line from the outlet - collect a set of five test cylinders at each location.
- (c) Specimens shall also be taken from the overflow upon completion of the pour – collect a set of five test cylinders at each location.

- (2) Care shall be taken to ensure that cylinder samples are not jostled or moved prior to the initial set. Each set of test cylinders shall be marked or tagged with the date and time of day the cylinders were made and the location in the work where they were sampled.

- d. Compression Testing: Two samples collected per Part 3.5.B.2.c.(1).(a) shall be tested at an age of 28 days. The third sample taken at the truck shall be a spare. Two samples each taken per Part 3.5.B.2.c.(1).(b) and (c) shall be tested at 7 days and 28 days. The fifth sample shall be a spare. A strength test result shall be the average of the compressive strengths of the two cylinders made from the same concrete sample and tested at the same age. Testing of the spare sample will be required when there are obvious defects in the other samples collected.

- e. Backfill concrete shall be tested for unconfined compressive strength in accordance with ASTM C39, and shall comply with the following criteria:

- (1) Minimum average 28-day compressive strengths for any 5 consecutive samples taken per Part 3.5.B.2.c.(1).(a) shall be 450 psi; and

- (2) No samples taken per Part 3.5.B.2.c.(1).(b) and (c) shall be less than 300 psi.
3. The following testing shall be performed for backfill cellular concrete:
- a. Unit Weight: Cellular concrete shall be tested for wet unit weight at the nearest location from point of injection (placement) in accordance with ASTM C567 from each batch of concrete from which compression test cylinders are made. Unit weight of backfill concrete shall be within 5 percent of the unit weight of the approved mix design.
 - b. Viscosity: Backfill cellular concrete shall be tested for viscosity at the nearest location from point of injection (placement) in accordance with ASTM C939/ASTM D6103 from each batch of concrete from which compression test cylinders are made. Viscosity shall be within 5 percent of the approved mix design.
 - c. Air Content: An air content test shall be made from each batch of concrete from which concrete compression test cylinders are made. Air content shall be determined in accordance with ASTM C796.
 - d. Compression Test Cylinders: Compression test cylinders shall be cast from each load, after every change in mix design, at a frequency of not less than once per hour. Each test cylinders shall be 3-inch by 6-inch. Test cylinders shall be sampled and made in the field, cured and stored in accordance with ASTM C495.
- (1) Sampling Locations:
- (a) Taken from the concrete delivery truck – collect a set of three test cylinders; and
 - (b) Taken from a system of valves in the line transporting the backfill concrete, which will allow for collection of test specimens at the nearest location to the point of injection without disconnecting the line from the outlet - collect a set of five test cylinders at each location.
 - (c) Specimens shall also be taken from the overflow upon completion of the pour – collect a set of five test cylinders at each location.
- (2) Care shall be taken to ensure that cylinder samples are not jostled or moved prior to the initial set. Each set of test cylinders shall be marked or tagged with the date and time of day the cylinders were made and the location in the work where they were sampled.

- e. Compression Testing: Two samples collected per Part 3.5.B.3.d.(1).(a) shall be tested at an age of 28 days. The third sample taken at the truck shall be a spare. Two samples each taken at the injection point per Part 3.5.B.3.d.(1).(b) and (c) shall be tested at 7 days and 28 days. The fifth sample shall be a spare. A strength test result shall be the average of the compressive strengths of the two cylinders made from the same concrete sample and tested at the same age. Testing of the spare sample will be required when there are obvious defects in the other samples collected.

- f. Cellular concrete shall be tested for unconfined compressive strength in accordance with ASTM C495, except that test specimens shall not be oven cured, and shall comply with the following criteria:
 - (1) Minimum average 28-day compressive strengths for any 5 consecutive samples taken per Part 3.5.B.3.d.(1).(a) shall be 450 psi; and
 - (2) No samples taken per Part 3.5.B.3.d.(1).(b) and (c) shall be less than 300 psi.

****END OF SECTION****

SECTION 16640

CATHODIC PROTECTION SYSTEM

PART 1 - GENERAL

1.1 THIS SECTION INCLUDES

- A. The WORK of this Section includes providing a complete cathodic protection system for the following structure as outlined in this Section and on the Drawings:
 - 1. Phase 2A of the Mid-City Pipeline consisting of approximately 820 linear feet of 66-inch mortar-lined and tape coated steel pipeline. The exterior of the pipeline shall have a concrete armor coat over the tape, field applied mortar over the tape coated joints and field applied mortar over any pipeline fittings or appurtenances that are not encapsulated in petrolatum wax tape.
- B. Electrical isolation of the structure from adjacent metallic structures, steel reinforced concrete structures, structures of dissimilar metal or dissimilar coatings, conduits and all other metallic components that may impact the operation of the cathodic protection system.
- C. Bonding of all non-welded, non-insulating pipe joints with stranded copper cables.
- D. Testing of system during installation including electrical continuity of the pipeline.
- E. Cleanup and restoration of work site.
- F. Testing the system after installation and backfill (Final System Checkout).

1.2 DEFINITIONS

- A. CONTRACTOR: The licensed prime installer selected by the CITY to install the pipeline
 - B. CITY: The City of San Diego
 - C. CORROSION ENGINEER: A qualified CORROSION ENGINEER retained by the CONTRACTOR who is either a Registered Professional CORROSION ENGINEER or NACE-international Certified CATHODIC PROTECTION SPECIALIST.
 - D. ENGINEER: The City of San Diego's Resident ENGINEER or designated representative
 - E. CITY'S CORROSION ENGINEER: The ENGINEER'S appointed representative from the City's Corrosion Section
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1.3 REQUIREMENTS

- A. If the products installed as part of this Section are found to be defective or damaged or if the WORK of this Section is not in conformance with these Specifications then the products and WORK shall be corrected at the CONTRACTOR's expense.
- B. Any retesting required due to inadequate installation or defective materials shall be paid for by the CONTRACTOR.
- C. The WORK also requires that one Supplier or Subcontractor accept responsibility for the WORK as indicated, but without altering or modifying the CONTRACTOR's responsibilities under the Contract Documents.
- D. The WORK also requires coordination of assembly, installation and testing between the pipeline contractor and any cathodic protection material supplier or subcontractor.

1.4 REFERENCED SPECIFICATIONS, CODES AND STANDARDS

- A. The WORK of this Section shall comply with the current editions of the following codes and standards:

- 1. AWWA American Water Works Association
 - a. C217 Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel Water Pipe and Fittings
- 2. ASTM ASTM International
 - a. D1248 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
 - b. B3 Standard Specification for Soft or Annealed Copper Wire
 - c. B8 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- 3. AASHTO American Association of State Highway and Transportation Officials
 - a. H20 Specification for Highway Bridges

4. NACE International, the Corrosion Society

- a. SP0169 Standard Practice, Control of External Corrosion on Underground or Submerged Metallic Piping Systems
- b. SP0286 Electrical Insulation of Cathodically Protected Pipelines
- c. SP0200 Standard Practice, Steel-Cased Pipeline Practices
- d. TM0497 Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Piping Systems

- B. Whenever the Drawings or these Specifications require a higher degree of workmanship or better quality of material than indicated in the above codes and standards, these Drawings and Specifications shall prevail.

1.5 PERMITS AND JOB ACCESS

- A. Prior to the start of construction, the CONTRACTOR shall apply to the required authorities for permits required for installation of the cathodic protection system.
- B. The CONTRACTOR shall contact Underground Service Alert prior to commencing construction to locate existing utilities in the area of construction. Existing utilities include, but are not limited to, water lines, gas lines, telephone, street lights, sewer and storm drains and overhead and underground electric utilities.
- C. Traffic control shall satisfy the requirements of the governing locality.

1.6 QUALITY ASSURANCE

- A. All work must be conducted by qualified personnel working under the direct supervision of a CORROSION ENGINEER. The CONTRACTOR doing the electrical installations shall have proper valid State of California licenses.
- B. All testing required to be performed by a "qualified corrosion technician" shall be performed by a NACE Level 2 CP Technician under the supervision of a Corrosion Engineer.

1.7 SUBMITTALS

- A. The following shall be submitted to the ENGINEER prior to any equipment installation.

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- 1. Catalog cuts, bulletins, brochures, or data sheets for all materials specified

herein.

2. Certification that the proposed equipment and materials meet the Specifications and the intent of the Specifications.
 3. Schedule including the expected start date and planned completion date.
- B. The following shall be submitted to the ENGINEER after completion of the WORK.
1. Wire connection testing.
 2. Insulating joint testing, before and after backfill.
 3. Casing insulator testing, before and after backfill.
 4. Electrical Continuity testing across inline specials
 5. System check-out report countersigned by the CORROSION ENGINEER. Report shall include all testing results performed throughout the project. Submit in both hardcopy and electronic copy formats.
 6. Record Drawings shall be submitted to and approved by the ENGINEER before the WORK is considered complete.

1.8 INTERFERENCE AND EXACT LOCATIONS

- A. The locations of cathodic protection equipment, test stations, devices, outlets and appurtenances as indicated are approximate only. Exact locations shall be determined by the CONTRACTOR in the field subject to the approval of the ENGINEER.
- B. The CONTRACTOR shall field verify all data and final locations of work done under other Sections of the Specifications required for placing of the electrical work.
- C. In case of interference with other work or erroneous locations with respect to equipment or structures, the CONTRACTOR shall furnish all labor and materials necessary to complete the WORK in an acceptable manner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials installed must be new. All equipment and materials supplied shall be similar to that which has been in satisfactory service for at least 5 years.

2.2 CONCRETE TRAFFIC VALVE BOXES

- A. Traffic valve boxes shall be rated to withstand AASHTO H20 traffic loading. The traffic valve boxes shall be G5 Utility Boxes as manufactured by Christy Concrete Products, Inc., No. 3RT Utility Box as manufactured by Brooks Products or approved equivalent. Traffic box covers for test stations shall be cast iron with welded bead legend and labeled "CPTEST". Concrete Traffic Valve Boxes and traffic box lids shall conform to SDW-128 and City of San Diego standards.

2.3 CONCRETE

- A. Concrete mix shall conform to the requirements specified in the City of San Diego Whitebook Section 201

2.4 UTILITY WARNING AND IDENTIFICATION TAPE

- A. The warning and identification tape shall be 3" wide and consist of a minimum 5.0 mil, five- ply 100% virgin polyethylene which is acid, alkaline and corrosion resistant. Tape shall have a minimum 20 gauge solid aluminum foil core, adhered to a 2.55 mil polyethylene backing.
- B. Tape shall be red and state "Caution Cathodic Protection Cable Buried Below".
- C. Utility warning and identification tape shall conform to the requirements specified in the City of San Diego Standard Drawings, SDM-105.

2.5 WIRES

- A. Conductors shall consist of stranded copper of the gauge indicated. Wire sizes shall be based on American Wire Gauge (AWG). Copper wire shall be in conformance with ASTM Designations B3 and B8.
- B. All wires terminating in a test station shall have a wire identifier attached within 4 inches from the end of wire at the terminal board, prior to backfill, as specified under "Wire Identification".
- C. High molecular weight polyethylene (HMWPE) insulating jackets shall conform to ASTM D1248.
- D. Test Station: Single-conductor, No. 6 AWG stranded copper with HMWPE insulation. Multi- stranded test leads or wire splicing is not allowed.
- E. Insulation Colors: per Contract Documents.

2.6 WIRE IDENTIFIERS

- A. Wire identifying labels shall be per the City Standard SDW-131.
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2.7 EXOTHERMIC WELDS

- A. Exothermic welds shall be in accordance with the manufacturer's recommendations. Exothermic welds shall be Cadweld, as manufactured by Erico Products, Inc. or Thermoweld as manufactured by Continental Industries, Inc., or approved equivalent. Duxseal packing as manufactured by Johns-Manville or approved equivalent shall be used where necessary to prevent leakage of molten weld metal.
- B. The shape and charge of the exothermic weld shall be chosen based on the following parameters:
 - 1. Pipe material
 - 2. Pipe size
 - 3. Wire material/size and requirement for sleeves
 - 4. Number of strands to be welded
 - 5. Orientation of weld (vertical or horizontal)

2.8 CABLE-TO-PIPE COATING MATERIAL

- A. Coating material for exothermic weld connections to the tape wrapped/mortar overcoated steel pipelines shall be two part epoxy resin such as Scotchcast Electrical Insulating Resin 4 manufactured by the 3M Company, or approved equivalent.
- B. Coating material for exothermic weld connection to lined and coated steel casings shall consist of a weld cap with integrated primer. The weld cap shall be a 10-mil thick durable plastic sheet that has a dome filled with a moldable compound to assure complete encapsulation of the exothermic weld and a layer of elastomeric adhesive with integrated primer. Adhesion to steel shall be at least 10 lb/in per ASTM D1000. Weld cap with integrated primer shall be Handy Cap IP manufactured by Royston or equivalent for wire size up to 8 AWG and Handy Cap XL IP manufactured by Royston or approved equal for wire size up to 2 AWG. The coating material for bare steel not covered by the weld cap shall be a bituminous mastic with a volume solids of 90% such as Bituminous Mastic 50-HT as manufactured by Hy-Tech Coatings, or approved equal.
- C. Weld coatings for pipelines to be buried shall be chosen with a cure time appropriate for the time restrictions required to backfill the pipeline after the CP wire connections have been made to the pipe.
- D. Viscous-Elastic Polyolefin Patch Alternative - An acceptable alternative to a liquid applied coating for exothermic welds is a patch consisting of a non-crystalline, a-polar viscous elastic, 100% solids polyolefin material that protects against corrosion of underground and aboveground substrates. The material must remain flexible and pliable in a semi-

solid state, contain no volatile organic compounds (VOCs), and it must have an immediate cure time with no stand by required before backfilling the pipeline. The material must be the Viscotaq patch manufactured by AMCORR or an approved equal. Patch must be sized to overlap the existing tape or epoxy coating by a minimum of 1-inch on all sides.

2.9 DIELECTRIC INSULATING FLANGE KITS

- A. For purposes of this specification, the terms "Pipe Flange Insulating Kit", "Insulated Flange", "Insulated Joint", and "Dielectric Flange" are used synonymously.
- B. Pipe flange insulating kit materials shall be designated by the manufacturer as suitable for service at the operating temperatures and pressures specified on the Plans.
- C. Insulating flange gaskets shall include full faced gaskets, insulating sleeves and washers and steel bolts, nuts and washers. The complete assembly shall have a pressure rating equal to or greater than the flanges between which it is installed. Sleeves, gaskets and insulating washers shall be G-10 composite materials and have a dielectric constant of 300 Volts per mil, minimum. Steel washers shall fit well within the bolt facing on the flange. Insulating washers shall fit within the bolt facing the flange over the outside diameter of the sleeve.
- D. For nominal pipe diameters greater than 36-inches, the insulating washers shall be installed sandwiched between a pair of matching steel washers on each side of the flange for each flange bolt.
- E. Provide four extra insulating sleeves and eight extra insulating washers for each insulating flange upon successful inspection of the insulating flange by the Engineer.

2.10 PETROLATUM TAPE

- A. Petrolatum tape system shall be Trenton Primer and #1 Wax-tape, as manufactured by Trenton Corp., or Denso Paste and Densyl Tape by Denso North America, Inc., or approved equivalent.

2.11 REBAR GROUND CABLE FOR CONCRETE STRUCTURES

- A. Provide a minimum size #6 AWG, bare copper stranded grounding cable to facilitate electrical isolation testing between the project pipeline and the steel reinforced concrete structure it penetrates. The quantity of cable required should be sufficient to run two ground cables from a flush-to-grade concrete ground box down to two separate exothermic connections made to rebar inside each concrete encasement or major reinforced concrete structure. Locate the rebar ground test boxes adjacent to cathodic protection test boxes.

PART 3 - EXECUTION

3.1 STORAGE OF MATERIALS

- A. All materials and equipment to be used in construction shall be stored in such a manner to be protected from detrimental effects from the elements. If warehouse storage cannot be provided, materials and equipment shall be stacked well above ground level and protected from the elements with plastic sheeting or other method as appropriate.

3.2 EXCAVATION AND BACKFILL

- A. Buried wires shall be placed in conduit and have a minimum cover of 24-inches.
- B. Caution tape shall be installed above buried wire. Caution tape shall be installed a minimum of 6 inches above underground wires and conduits. See Standard Drawing SDM-105.

3.3 TEST STATIONS

- A. Test stations shall be installed at the approximate locations shown on the Drawings. Flush mounted test stations shall be located behind the curb and other areas not subject to vehicular traffic to allow for safe access by City monitoring personnel, which will not require traffic control. The CONTRACTOR shall field verify final location of the test stations. Wire identifiers shall be placed on all wire prior to backfill and installation of test stations.
- B. Installation of test stations shall be done in the presence of the ENGINEER. A minimum notice of 48 hours shall be given by the CONTRACTOR to the ENGINEER prior to installation of a test station. Installation of test stations shall begin early enough in the day to ensure completion of the installation during regular working hours.
- C. The CONTRACTOR shall provide global positioning system (GPS) coordinates of each test station location with a minimum accuracy of 1 meter or 3 feet. The CONTRACTOR shall submit the GPS coordinates of the test stations to the ENGINEER after installation.

3.4 WIRES

- A. Buried wires shall be placed in conduit and be without kinks. Each wire run shall be continuous in length and free of joints or splices, unless otherwise indicated. Care shall be taken during installation to avoid punctures, cuts or other damage to the wire insulation. Damage to insulation shall require replacement of the entire length of wire at the CONTRACTOR's expense.
- B. 18 inches of slack (coiled) shall be left for each wire at each flush-to-grade test station. Wire slack shall be sufficient to allow removal of wire extension for testing. Wire shall not be bent into a radius of less than 2 inches.

3.5 WIRE IDENTIFIERS

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- A. All wires shall be coded with wire identifiers.

- B. Wire identifiers shall be placed on the wires prior to backfill.

3.6 EXOTHERMIC WELD CONNECTIONS

- A. Exothermic weld connections shall be installed in the manner and at the locations indicated. Coating materials shall be removed from the surface over an area of sufficient size to make the connection. The surface shall be cleaned to bare metal by grinding or filing prior to welding the conductor. The use of resin impregnated grinding wheels will not be allowed. A copper sleeve shall be fitted over the conductor. Only enough insulation shall be removed such that the copper conductor can be placed in the welding mold.
- B. The CONTRACTOR shall be responsible for testing all test lead welds. The ENGINEER, at his or her discretion, shall witness these tests.
- C. After the weld has cooled, all slag shall be removed and the metallurgical bond shall be tested for adherence by the CONTRACTOR. A 22-ounce hammer shall be used for adherence testing by striking a blow to the weld. Care shall be taken to avoid hitting the wires. All defective welds shall be removed and replaced.
- D. After backfilling the pipe, all test lead pairs shall be tested for broken welds using a standard ohmmeter. The resistance shall not exceed 150% of the theoretical wire resistance as determined from published wire data.
- E. The CONTRACTOR shall inspect both the interior and exterior of the pipe to confirm that all coatings and linings removed or damaged as a result of the welding have been repaired. The CONTRACTOR shall furnish all materials, clean surfaces and repair protective coatings and linings damaged as a result of the welding. Repair of any coating or lining damaged during welding shall be performed in accordance with the coating or lining manufacturer's recommendations.
- F. All exposed surfaces of the copper and steel shall be covered with insulating materials as indicated.
- G. Mortar shall be applied to the project pipeline at all wire-to-pipe connections. The mortar shall match the exterior mortar. Coating repairs shall be performed in accordance with the coating Manufacturer's recommendations.

3.7 PETROLATUM TAPE SYSTEM APPLICATION

- A. Petrolatum tape system shall be applied on insulating joints and as indicated in the Drawings. Petrolatum tape system shall be applied in accordance with AWWA C217, and these Specifications. The materials shall be applied according to the Manufacturer's recommendations.

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- B. All loose scale shall be removed from the surface to be coated with hand tools (wire

brush, scraper, rags). Debris and moisture shall be wiped from surface with clean rag. Petrolatum tape shall be applied immediately after applying the primer, using a 1-inch overlap. A spiral wrap shall be used and a slight tension shall be applied to ensure that there are no air pockets or voids. After applying the tape, the applicator shall firmly press and smooth out all lap seams and crevice areas. The tape shall be in tight intimate contact with all surfaces.

3.8 WIRE CONNECTIONS

- A. After installation, all wire connections shall be tested at the test station locations, by the CONTRACTOR, to ensure that they meet the requirements and intent of the Contract Documents.

3.9 INSULATING JOINTS

- A. Insulating joints shall be installed to effectively isolate metallic piping from foreign metallic structures. Provide a minimum of five days advance notice to the Engineer before assembling insulated pipe flanges 60 inches or larger in diameter to allow for coordination and observance of its installation. The Engineer shall inspect the condition of the gasket's O-ring immediately before the gasket is installed to ensure it is free of cracks, dry rot, cuts, or other defects.
- B. Install pipe flange insulating materials at the locations shown on the Plans. Install pipe flange insulating materials in accordance with the manufacturer's recommendations and NACE standard practice SP0286, "Electrical Isolation of Cathodically Protected Pipelines." Particular attention shall be paid to properly aligning the flanges prior to inserting the insulating sleeves around flange bolts. Prevent moisture, soil, or other foreign matter from contacting any portion of the insulated flange prior to or during installation. If moisture, soil, or other foreign matter contacts any portion of the insulated flange, disassemble it, clean with a suitable solvent and dry prior to reassembling. Follow the manufacturer's recommendations regarding the torquing pattern of the bolts and the amount of torque to be used when installing the flange insulating kit. Do not use conductive grease on the flange bolts or any other flange components. Note: the following products have been tested for electrical conductivity and approved for use: Huskey 2000 Lubricating Paste & Anti-Seize compound, 3M Super 77 Spray Adhesive, and Triflow aerosol lubricant with Teflon additive.
- C. Test the electrical isolation effectiveness of each insulated pipe flange. This testing shall be performed by the Contractor's Cathodic Protection Engineer and witnessed by the Engineer. The Contractor shall provide written notice of this testing to the Engineer a minimum of two days in advance. If the insulated pipe flange will be buried, it shall be tested for electrical isolation by the Contractor before the wax tape coating is applied. At the Engineer's option, the City of San Diego may repeat this testing during or immediately after the installation of the insulating flange. Replace or repair any insulated pipe flange that is determined to not meet the minimum electrical isolation requirements in this specification. The effectiveness of insulating flanges shall be determined using the following test techniques in the order shown until one of the criteria is achieved or as

otherwise directed by the Engineer.

1. Electrical Potential Difference Test: Electrically bond the pipe on the vault or unburied side of the insulating flange to an electrical ground with a maximum resistance to remote soil of 5-Ohms. If the pipe on both sides of the insulating flange is mechanically connected to a minimum 50-feet of buried pipe, then the pipe does not need to be bonded to an electrical ground for this test. Measure the CP Potential of the pipe on both sides of the insulating flange using a copper/copper sulfate reference electrode. If the difference in CP Potentials is greater than or equal to 500-millivolts, the insulating flange is providing adequate electrical isolation. This test must be performed with all cathodic protection systems and anodes disconnected from the pipeline. If this criterion is not met, perform the Nilsson 400 Meter Direct Resistance Test to verify the effectiveness of the insulating flange.
2. Direct Resistance Test: Measure the electrical resistance across the insulated flange using a 97-Hertz square wave null balancing ohmmeter such as the Model 400 Nilsson Soil Resistance Meter and the four-wire resistance technique. A standard handheld digital multi-test meter's ohmmeter circuit (e.g. Fluke 97 or Beckman HD110) is not suitable for properly making these resistance measurements. Perform this test by connecting the meter's P1 and C1 terminals to one side of the insulating flange, using two wires, and then connecting the meter's P2 and C2 terminals to the other side of the insulating flange, using two additional wires. Use vise grips or temporary exothermic welds to make the wire connections to the flange or pipe. The criterion for a pipe filled with water is a minimum measurement of 5-Ohms. The criterion for a dry or a partially filled pipe is a minimum measurement of 100-Ohms. If none of the applicable criteria are met, perform the Inductive Ammeter Direct Resistance Test to verify the effectiveness of the insulating flange.
3. Inductive Ammeter Direct Resistance Test: Connect two separate wires via two separate connections to the pipe on both sides of the insulating flange. Use vise grips or temporary exothermic welds to make the wire connections. Use two pairs of test wires, one for current flow, one for voltage measurement. Using the first set of test wires, apply a minimum 12-volt DC electrical current across the insulating flange. Using the second set of test wires, measure the voltage across the insulating flange developed by the DC current flow. Use an inductive ammeter hoop (e.g. Swain hoop) clamped around the pipe immediately adjacent to the insulating flange to measure the change in DC current flow in the pipe, through the insulated flange. Calculate the electrical resistance across the insulating flange in Ohms by dividing the change in DC Volts by the change in DC Amps (i.e. Ohm's Law). The criterion for a pipe filled with water is a minimum measurement of 5-Ohms. The criterion for a dry pipe is a minimum measurement of 100-Ohms. If

either of the applicable criteria is not met, perform the NACE Insulating Flange Leakage Test, per NACE SP0286, to verify the effectiveness of the insulating flange.

4. NACE Insulating Flange Leakage Test: This test procedure shall conform to the "Leakage Test" described in the NACE Standard SP0286, Section 8, "Field Testing and Maintenance", Figure 12. The test current used shall be between 3 and 5 DC Amps. The criterion for a pipe filled with water is a maximum "electrical leakage value" of 10-percent of the test current. The criterion for a dry pipe is a maximum "electrical leakage value" of 5-percent of the test current.

- D. Individual Flange Bolt Testing: For all insulated flanges to be buried and for all other insulating flanges that do not meet any of the other criteria, measure the electrical resistance of each flange bolt to both sides of the insulated flange using a Nilsson Model 400 Soil Resistance Meter and four-wire resistance technique. The measured resistance value for each flange through-bolt shall be a minimum of 1,000-Ohms, as measured from each bolt to both flanges. This criterion applies to the flange through-bolts and does not apply to valve cap bolts which are threaded on one side. Remove, inspect, and replace all dielectric flange bolt sleeves and washers that do not meet the minimum resistance criterion.
- E. If an insulated flange with threaded cap bolts passes the resistance tests for all the "through-bolts" yet fails the other previous tests, remove all the threaded cap bolts, inspect and replace all imperfect dielectric flange bolt sleeve and washer materials and retest.
- F. In order to make an accurate resistance measurement that passes any of these criteria it may be necessary to disable the pipe inside a vault, flow control facility, or pump station on one side of the insulated flange (or temporarily remove any electrically grounded appurtenances) so that the pipe is not grounded on one side of the insulated flange. This temporary change may eliminate an electrical path which interferes with making an accurate resistance measurement.

3.10 ELECTRICAL ISOLATION TESTING BETWEEN PIPE AND STEEL REINFORCEMENT

- A. Conduct visual and electrical testing at all steel pipe penetrations through reinforced concrete structures before and after the concrete is placed. This testing is required to demonstrate that all buried steel pipe is not in contact with any metallic objects embedded in the concrete wall, concrete slab, or structural concrete pipe encasements. The embedded objects to be verified for metallic isolation from steel pipe include all of the following:
 1. rebar
 2. rebar tie wire
 3. snap ties

4. shebolts
 5. tie rods
 6. taper ties
 7. dowels
- B. Perform this testing no more than 1 day before each concrete placement and no more than 1 day after each concrete placement. Correct all direct contacts detected between sections of pipe to be buried and concrete reinforcing components by trimming or repositioning the reinforcement components. If pipe to reinforcement contacts are detected after concrete is in place, use chipping hammers and other concrete demolition tools to remove as much concrete as is necessary to eliminate all metallic points of contact with the steel pipe. This metallic isolation testing shall be performed by the Contractor's Cathodic Protection Engineer or Technician and witnessed by the Engineer. A representative from the City of San Diego, Water System Operations, Corrosion Section shall be notified a minimum of 7 days before the first pipe-vault penetration concrete is placed in order to review the equipment and test procedure to be used and to witness the contractor actually performing the tests. The failure for a new buried steel pipeline to pass this electrical isolation test may require concrete and reinforcing steel to be incrementally demolished by the contractor at no cost to the City of San Diego until the new steel pipeline passes the electrical isolation test.
- C. Perform all electrical resistance measurements for this test using a 97-Hertz square wave null balancing ohmmeter such as the Nilsson Model 400 Soil Resistance Meter or the MC Miller Model 400A and the four-wire resistance technique to compensate for the test wire and connection resistances. A standard handheld digital multi-test meter's ohmmeter circuit (e.g. Fluke 87) is not suitable for properly making these resistance measurements. Perform this test by connecting the meter's P1 and C1 terminals to the pipe, using two different wires and two different connections, and then connecting the meter's P2 and C2 terminals to the rebar, using two additional wires and connections. Use vise grips or temporary exothermic welds to make the wire connections to the pipe and rebar.
- D. Rebar Ground Cable Connections at Pipe Encasements and Vault Penetrations: Select two exposed pieces of rebar separated by at least 2 feet that are wire tied to a minimum of 6 other perpendicular pieces of rebar for use as electrical ground reference test points. Using temporary connections such as vice grips or other compression clamps measure the electrical resistance between the two different pieces of rebar to ensure that the rebar test points are electrically continuous with the bulk of the rebar in the concrete structure. If either piece of rebar is not securely wire tied to all the other rebar in the encasement or vault, then the electrical resistance measurement will yield erroneous or misleading data. A maximum resistance of 0.10 Ohm between the two rebar test points is required before continuing
-

with the electrical isolation test. Connect two unspliced lengths of minimum size #6 AWG bare copper stranded grounding cable to two different pieces of rebar. Each ground cable connection to the rebar shall be made with a separate exothermic weld or a separate mechanical compression ground clamp.

- E. Direct Resistance Isolation Test: Testing shall first be performed using the Direct Resistance Test. Attach one pair of the resistance test leads to the pipe and one pair of resistance test leads to the rebar then measure the pipe to rebar resistance. If the resistance is 10 Ohms or more, the pipe is sufficiently electrically isolated from the rebar. If the test reading is less than 10 Ohms, proceed with the Steel Polarization Isolation Test described below.

- F. Steel Polarization Isolation Test:
 - 1. Step 1: Measure the baseline CP potentials of the buried pipeline and of the rebar using a stationary location for a copper sulfate reference electrode. Place the reference electrode in soil at an offset distance from the pipeline equal to approximately the length or width (whichever is greater) of the concrete structure under construction. If the difference between the readings of the pipe and rebar is 500 millivolts DC or more, that indicates sufficient electrical isolation. This test must be done with all nearby sources of cathodic protection electrical current turned off or disconnected, and with all welding equipment turned off. If the difference is less than 500 millivolts DC, record the baseline CP Potentials and proceed to the next step.
 - 2. Step 2: Set up a temporary DC power source such as a truck battery, a minimum 300 Watt, 2 to 4 Ohm, power rheostat, a calibrated electrical shunt, and two minimum #6 AWG test cables. Set up the DC power source with the positive cable connected to the rebar and the negative cable connected to the pipe. Initially adjust the rheostat for the largest resistance/smallest current and measure the current flow. Adjust the electrical power to a minimum current of 1 DC Amp, maximum of 10 DC Amps. Allow the DC current to flow for a minimum of 5 minutes then shut off the test current.
 - 3. Step 3: Remeasure CP Potentials of the pipe and rebar using the same reference electrode in the same location with the test current off. These are called polarized CP potentials.
 - 4. Step 4: Compare the polarized CP Potentials with the previously measured baseline CP Potentials. If the pipe is electrically isolated from the rebar, the test current will polarize the buried pipeline's steel cathodically (i.e. a more negative CP Potential) and shift the rebar anodically (i.e. a more positive CP Potential). If the difference between the polarized potentials of the pipeline and rebar is less than 300

millivolts DC there are one or more metallic contacts between the buried pipeline and the rebar. If the difference is 300 millivolts DC or greater the steel pipeline is sufficiently electrically isolated from the rebar.

- G. If a Contractor wishes to use an alternate test procedure, prepare a written test procedure specifying the methods and equipment that will be used. Submit it to the Engineer for approval a minimum of 30 days before the first concrete placement. In no case shall an electrical resistance measurement made with a hand held volt-ohm multimeter be accepted as an accurate isolation test procedure. In the event of a question regarding the electrical isolation of the pipeline, the Engineer shall make the final determination.
- H. Electrical isolation tests shall be conducted for each pipeline encasement, each pipe to vault penetration, and any other reinforced concrete structure that a pipeline passes through. The electrical isolation tests must be performed by the contractor one day before concrete is placed, and the day after concrete is placed. The Engineer will witness the electrical isolation test conducted before the concrete is placed.
- I. After the pipeline passes the rebar isolation test, direct bury the two bare copper ground cables connected to the rebar to a flush-to-grade concrete ground box near the pipe-vault penetration. Provide a cover for the test box marked "GROUND". Provide a minimum of two (2) feet of extra ground cable inside the rebar ground test box. If there is a nearby cathodic protection test box the rebar ground wires can be run into that box. If the rebar test wires are not long enough to reach the permanent test box, splice additional wire to them using two brass split bolts for each splice. No coating is required for the connections.

3.11 CASING INSULATORS

- A. Need testing for electrical isolation between reinforcing steel and pipe where it ingresses/egresses concrete structures.
- B. Casing insulators shall be installed to effectively isolate the pipeline from the casing. The CONTRACTOR shall test the performance of the casing insulators before and after backfill.
- C. A Conduct visual and electrical testing at all locations where steel pipe is constructed inside steel casings to ensure nonmetallic casing spacers have been installed properly to prevent any metallic contact between the steel pipe and the casing. This testing must be performed as soon as possible after the steel pipe has been inserted into the casing so that the equipment used to move the pipe can be used to reposition the steel pipe if the electrical isolation testing shows metallic contact is occurring.

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- D. Perform this testing the same day that each segment of pipe is installed inside the steel

casing. Correct all direct contacts detected between sections of steel pipe and casing by repositioning or replacing components of the nonmetallic casing spacers.

- E. If a pipe to casing contact is detected after the pipe is in place inside a casing, reposition or remove the steel pipe to investigate where the metallic contact is occurring. This metallic isolation testing shall be performed by the Contractor's Cathodic Protection Engineer or Technician and witnessed by the Engineer. A representative from the City of San Diego, Water System Operations, Corrosion Section shall be notified a minimum of 7 days before the first pipe is installed inside a steel casing in order to review the equipment and test procedure to be used and to witness the contractor actually performing the tests. The failure for a new steel pipeline to pass this electrical isolation test may require the steel pipe sections to be completely removed from the casing by the contractor at no cost to the City of San Diego in order to correct problems with the nonmetallic casing spacers so that the new steel pipeline passes the electrical isolation test.
- F. Perform all electrical resistance measurements for this test using a 97-Hertz square wave null balancing ohmmeter such as the Nilsson Model 400 Soil Resistance Meter or the MC Miller Model 400A and the four-wire resistance technique to compensate for the test wire and connection resistances. A standard handheld digital multi-test meter's ohmmeter circuit (e.g. Fluke 87) is not suitable for properly making these resistance measurements. Perform this test by connecting the meter's P1 and C1 terminals to the steel pipe, using two different wires and two different connections, and then connecting the meter's P2 and C2 terminals to the steel casing, using two additional wires and connections. Use vise grips or temporary exothermic welds to make the wire connections to the pipe and casing.
- G. Casing Ground Cable Connections: Connect two unspliced lengths of minimum size #6 AWG copper stranded wire to the casing at any location. Each ground cable connection to the casing shall be made with a separate exothermic weld.
- H. Direct Resistance Isolation Test: Testing shall first be performed using the Direct Resistance Test. Attach one pair of the resistance test leads to the pipe and one pair of resistance test leads to the casing then measure the pipe to casing resistance. If the resistance is 10 Ohms or more, the pipe is sufficiently electrically isolated from the casing. If the test reading is less than 10 Ohms, proceed with the Steel Polarization Isolation Test described below.
- I. Steel Polarization Isolation Test:
 - 1. Step 1: Measure the baseline CP potentials of the buried pipeline and of the casing using a stationary location for a copper sulfate reference electrode. Place the reference electrode in soil at an offset distance from the pipeline equal to approximately one half of the length of the casing. If the difference between the readings of the pipe and casing is 500 millivolts DC or more, that indicates sufficient electrical isolation.

This test must be done with all nearby sources of cathodic protection

electrical current turned off or disconnected, and with all welding equipment turned off. If the difference is less than 500 millivolts DC, record the baseline CP Potentials and proceed to the next step.

2. Step 2: Set up a temporary DC power source such as a truck battery, a minimum 300 Watt, 2 to 4 Ohm, power rheostat, a calibrated electrical shunt, and two minimum #6 AWG test cables. Set up the DC power source with the positive cable connected to the casing and the negative cable connected to the pipe. Initially adjust the rheostat for the largest resistance/smallest current and measure the current flow. Adjust the electrical power to a minimum current of 1 DC Amp, maximum of 10 DC Amps. Allow the DC current to flow for a minimum of 5 minutes then shut off the test current.
 3. Step 3: Remeasure CP Potentials of the pipe and casing using the same reference electrode in the same location with the test current off. These are called polarized CP potentials.
 4. Step 4: Compare the polarized CP Potentials with the previously measured baseline CP Potentials. If the pipe is electrically isolated from the casing, the test current will polarize the buried pipeline's steel cathodically (i.e. a more negative CP Potential) and shift the casing anodically (i.e. a more positive CP Potential). If the difference between the polarized potentials of the pipeline and casing is less than 300 millivolts DC there are one or more metallic contacts between the buried pipeline and the casing. If the difference is 300 millivolts DC or greater the steel pipeline is sufficiently electrically isolated from the casing.
- J. If a Contractor wishes to use an alternate test procedure, prepare a written test procedure specifying the methods and equipment that will be used. Submit it to the Engineer for approval a minimum of 30 days before the first concrete placement. In no case shall an electrical resistance measurement made with a hand held volt-ohm multimeter be accepted as an accurate isolation test procedure. In the event of a question regarding the electrical isolation of the pipeline, the Engineer shall make the final determination.
- K. Electrical isolation tests shall be conducted for each pipe running through a steel casing. The electrical isolation tests must be performed by the contractor the same day that the pipe is inserted into the casing. The Engineer will witness the electrical isolation test.
- L. After the pipeline passes the casing isolation test, direct bury the two bare copper ground cables connected to the casing to a flush-to-grade concrete ground box near the end of the casing. Provide a cover for the test box marked "GROUND". Provide a minimum of two (2) feet of extra ground cable inside the rebar ground test box. If there is a nearby cathodic protection test box the rebar ground wires can be run into that box. If the rebar test wires are not long enough to reach the permanent test box, splice additional wire to

them using two brass split bolts for each splice. No coating is required for the connections.

- M. If the pipe is not isolated from the casing, correct retested at the CONTRACTOR's expense.

3.12 CONTINUITY TESTING

- A. Continuity testing of all joints and pipe sections having in-line valves shall be performed by the CONTRACTOR's qualified corrosion technician as defined in this section after backfill. The electrical continuity test may additionally be performed before backfill at the CONTRACTOR's option.
- B. The pipe shall be tested for electrical continuity. Continuity shall be verified using the linear resistance method. Each test span shall have two test leads connected to the pipe at each end. Existing test stations may be used. A direct current shall be applied through the pipe using two of four test leads. The potential across the test span shall be measured using the other two test leads. The current applied and voltage drop shall be recorded for a minimum of three different current levels.
- C. The theoretical resistance of the pipe shall be calculated. It shall take into account the pipe material, segment length, wall thickness and number of joint bonds within the span.
- D. Acceptance of the test span: The average measured resistance shall be compared to the theoretical resistance of the pipe. If the measured resistance is greater than 120% of the theoretical resistance, then the welded joints shall be considered deficient and shall be repaired and retested at the CONTRACTOR's expense. If the measured resistance is less than 100% of the theoretical resistance then the test and/or calculated theoretical resistance shall be considered deficient and the test span shall be retested and/or recalculated at the CONTRACTOR's expense. If the piping forms a loop which allows current to flow both in and out of the test span, then consideration shall be made for current circulating through both the loop and the test span.

3.13 SYSTEM CHECKOUT

- A. Upon completion of the installation, the CONTRACTOR shall provide testing of the completed system by a qualified corrosion technician. The data shall be reviewed by a Corrosion Engineer to ensure conformance with the Contract Documents, NACE SP0169, and NACE SP0286.
- B. The testing described herein shall be in addition to and not substitution for any required testing of individual items at the Manufacturer's plant and during installation.
- C. Testing shall be performed at all test leads of all test stations and at the locations of exposed pipe as soon as possible after installation of the cathodic protection system.
- D. Testing shall include the following and shall be conducted in accordance with NACE TM0497:

1. Measure and record native pipe-to-soil and casing-to-soil potentials at all test locations.
 2. Verify electrical isolation at all insulating joints and casing insulators per NACE SP0286 and SP0200.
 3. Confirm electrical continuity of the pipeline or cathodically protected structure in accordance with this Section.
 4. Measure and record the "On" and "Instant Off" potentials at each location.
- E. Test results shall be analyzed to determine compliance with NACESP0169.
- F. Test results shall be analyzed to determine if stray current interference is present. Stray current interference is defined as a +/-50 milliVolt shift in a pipeline's pipe-to-soil potential that is caused by a foreign current source. Stray current interference shall be tested on the project pipeline and foreign pipelines that have a reasonable chance of being affected by stray currents.
- G. The CONTRACTOR shall provide a written report, hardcopy and electronic, prepared by the Corrosion Engineer, documenting the results of the testing, including GPS locations and recommending corrective work, as required to comply with the Contract Documents. Any deficiencies of systems tested shall be repaired and re-tested by the CONTRACTOR at no additional cost to the CITY.

PART 4 - PAYMENT

4.1 CATHODIC PROTECTION SYSTEM

- A. The payment for a complete cathodic protection system shall be paid under the lump sum bid item and shall include all work necessary for the installation and testing of a fully operational cathodic protection system.

**** END OF SECTION ****

ENGINEER OF WORK

The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineer:

Michael Pollard

11/22/2017

Seal:



1) Registered Engineer

Date

Brian Vitele

11/22/2017

Seal:



2) For City Engineer

Date

A. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

THE SUBMITTAL DATE FOR THIS PROJECT HAS BEEN **EXTENDED AS STATED ON THE COVER PAGE.**

B. BIDDER'S QUESTIONS

Q1. Is the city considering Ignition by Inductive Automation for the SCADA upgrades mentioned in the K-18-1545-DBB-3, Mid-City Pipeline Phase 2A project?

A1. Ignition by Inductive Automation will not be used for this project. City will be integrating the new facility into the existing SCADA HMI system. Programming of the Central HMI system will be done by the CITY, CONTRACTOR to coordinate and provide support for this task.

Q2. Can you please tell us where on the Plans the Geotechnical Instrumentation (Extensometers, Inclinometers, Multi-Point Borehole Extensometers, Standpipe Piezometer(s) / Observation Well(s) are located? We need depths and diameters as well.

A2. None of the instrumentation is required. This specification section is available as a guide if the contractor feels instrumentation is needed to help protect the existing SDCWA aqueduct during tunnel operations

Q3. Attachment E: Supplementary Special Provisions Section 212-5.6 Air.

Combination air and vacuum valves shall have piped outlets to the nearest acceptable drain, firmly supported and installed in such a way as to avoid splashing and wetting of floors.

A3. No discharge to nearest drain is required.

Q4. SGC Geotechnical investigation Section 10.4 Shaft/Pit Construction Recommendations for rectangular shafts. Prior to excavation the

soldier piles would be installed in predrilled holes and backfilled with concrete. For circular shafts, a support with the contractor's design using soldier piles require holes to be backfilled with concrete? Or would another backfill material be acceptable?

- A4. The contractor is not required to follow the shaft construction recommendations in the soils report and can provide an alternative shoring system design that he/she is more comfortable using.
- Q5. DRAWING C-7 shows a metal insertion meter per detail 2 on C-10. The detail shows an extra strong weld o let welded to the steel can. The welding would require a shut down. Most shut downs by the SDCWA occur during the months of November and February. **Does the city operate the line or has the City coordinated with SDCWA regarding the shut and draining?**
- A5. It is a City Pipeline.
- Q6. ACCESS MANWAY DIMENSION: Drawing C-1 Access Manway No. 1 Length of Encasement scales approximately 20 feet. Detail 4 on C-6 Length of Encasement scales 10 feet. Which is correct?
- A6. By encasement, if you are referring to the concrete cradle, then the dimension on sheet C-6 is correct. The 20' dimension on C-1 is the approximate length of the launching pit.
- Q7. There is no specification section in the contract doc's for the coatings and plug valves. Please advise.
- A7. Plug valves are covered by the Greenbook, section 212-5.3. Coatings are covered in section 210 of Greenbook.
- Q8. There is also no Air Vac Detail as suggested on plan page C-10 #3? Please advise.
- A8. Air/Vac Valve details are shown in the City Standard Details, Drawing SDW-160.

- Q9. There is no blow off detail as well? I need to know what are the isolation valves required for both Air Vac & Blow offs.
- A9. Blowoff details are in the City's standard drawings.
- Q10. This letter is submitted in regard to Bid No. K-18-1545-DBB-3, Mid City Pipeline Phase 2A. Supplementary Special Provisions, Section 4 - Control of Materials, Paragraph 4-1.3 Inspection Requirements, which sets forth the requirements for inspection of steel pipe larger than 18 inches. Item No. 3 under Paragraph 4-1.3.1 requires that all parts of the manufacturing of steel pipe shall be performed or produced in the United States. However, materials used to manufacture the steel pipe are not required to be supplied from the United States. We were not able to locate any other requirement in the documents for other products or materials on the project to be produced in the United States. It appears that this requirement was added specifically to exclude steel pipe from being produced at the Ameron facility in San Luis Rio Colorado, Sonora, Mexico. The Ameron facility is under 150 miles from the City of San Diego which is within the 200 mile limit for inspection of "Locally Produced" materials in Paragraph 4- 1.3.3.

It appears that the intent of the specification requirement is to impose a portion of the California Buy American act, previously codified in Government Code Section 4303 which attempted, in pertinent part, to require utilization of manufactured materials only fabricated and produced in the United States. That Code Section was declared unconstitutional in the case of Bethlehem Steel Corp. v. Board of Commissioners (1969) 276 Cal App 2d 221. In that case, the court held that the restriction impinged on powers vested solely with the Federal Government to restrict trade with foreign countries and improperly impacted that trade. California has not attempted to implement any legislation similar since that code section was struck down in 1969. Thus, any such restriction would appear to be improper.

It appears that the specification is trying to do what the court has already ruled is solely within Federal government to regulate. How

does the city justify requiring that steel pipe larger than 18 inches be manufactured in the United States and not require the same of every other product required for this project? This requirement is limiting competitive bidding on a project where realistically only one supplier, a competitor of Ameron, may submit an unfair, anticompetitive, monopolistic bid for the steel pipe.

- A10. It is the City's contention that *Bethlehem Steel Corporation v. Board of Commissioners* does not apply to the Notice Inviting Bids for the subject project. The Bid Solicitation for this project seeks to provide a level field for prospective bidders while ensuring compliance with applicable manufacturing requirements, adherence to Quality Control and Quality Assurance (QC/QA) procedures and appropriate certification of fabrication staff and third party independent Quality Assurance inspectors.

The specification section 4-1.3.4 which requires all pipe fabrication and inspection to be done in the United States is not specifically intended to preclude utilization of Ameron's San Luis Rio Colorado plant. The City welcomes Ameron to the competitive bidding process with pipe fabricated at one of its U.S. facilities. This specification is intended to limit the time required to review submittals and verify credentials of fabrication staff and avoid project delays associated with submittal review when these are in another language or not as cited by AWWA standards. It is also intended to ensure the City is provided the opportunity to review and approve the third party independent Quality Assurance inspector prior to any pipe fabrication.

While the City, in its best interest, has discretion to solicit bids requiring U.S.A. only manufacturing, the City cannot make exception to the U.S.A. only manufacturing requirements for Ameron or any other pipe manufacturer as an approved facility because of proximity, price advantage, or credentials. It would be impracticable, unreasonable, and not in the best interest of the City to place these burdens on the City. The *Bethlehem* case did not intend to place these type of burdens and challenges on a public entity.

Q11. Per section 307-2.2.a 2) & 3) - pipe jacking and other trenchless construction methods maybe approved by the Engineer. However, section 02443 is specifically written for Micro Tunneling (MTBM).

Please clarify that conventional jack and bore methods will be an acceptable means and method to use on this project and that section 02243 is only applicable if MTBM is used.

A11. Yes, Conventional jack/bore is an acceptable method for installation of the tunnel under the SDCWA aqueduct provided the contractor can present a plan that is suitable to the engineer. In addition to the size/type of equipment used, the contractor will have to demonstrate how he/she proposes to handle the stadium conglomerate, any perched groundwater, stadium conglomerate/soil interface, protection of SDCWA aqueduct, etc.

Q12. Per section 02443, 3.4 Hyperbaric intervention

Please clarify if all Hyperbaric intervention will be paid as extra work. Please clarify under what circumstances it will not be paid as Extra work.

A12. Yes, all Hyperbaric intervention will be paid as extra work.

Q13. Section 307-2.2.a.5 states the minimum Geotechnical Instrumentation at each underground xing is 1ea piezometer, 3ea settlement monitoring points and 5ea surface markers.

Section 02443 references MPBX instrumentation trigger levels, but no quantity of instruments.

Section 02496 references various Geotechnical instruments beyond those specified in 307-2.2.a.5.

These three sections are overlapping and not coordinated.

Please provide details for the instruments referenced in section 307-2-2.a.5

Please specify the exact type and quantity instruments that are required and the survey requirements.

A13. Geotechnical instrumentation specifications provided for reference. Contractor is not required to use them if he/she feels the tunneling can be installed without them. If the Contractor feels they are necessary, he/she will be required to provide a submittal showing the size/type/number/location of instruments necessary.

Q14. Plans C-7 – please provide asbuilt plans and dewatering points of the ex'g 48".

A14. Dewatering points to be determined by dewatering contractor.

C. SUPPLEMENTARY SPECIAL PROVISIONS

1. To Attachment E, Technicals, Section 15102 – Triple Offset Metal Seated Butterfly Valve, Part 2 – Materials, Subsection 2.2, Butterfly Valve, Item A, Sub-item 2, page 203, **DELETE** in its entirety and **SUBSTITUTE** with the following:
 2. Valve seating surface for the seal ring shall be integral to the valve body or on the disc edge and shall be overlaid with a satellite of a minimum of 2.5 millimeters in the finished condition. A 316 SS valve disc is a suitable alternative.
2. To Attachment E, Technicals, Section 15102 – Triple Offset Metal Seated Butterfly Valve, Part 2 – Materials, Subsection 2.2, Butterfly Valve, Item A, Sub-item 3, Item e, page 203, **DELETE** in its entirety and **SUBSTITUTE** with the following:
 - e. A spiral wound gasket or flat static gasket shall be provided by the Contractor to prevent leakage around the seal ring.
3. To Attachment E, Technicals, Section 15102 – Triple Offset Metal Seated Butterfly Valve, Part 2 – Materials, Subsection 2.2 Butterfly Valve, Item A, Sub-Item 5, page 204, **DELETE** in its entirety and **SUBSTITUTE** with the following:
 5. Valve bearings shall be Ni-Resist or Type 316 stainless steel baked PTFE. Bearings shall be sealed from the ingress of particulates.

Wetted bronze parts shall be in conformance with ASTM B62, containing not more than: 5-percent zinc, 2-percent aluminum, 8-percent lead, and 83-percent copper plus nickel, plus silicon.

4. To Attachment E, Technicals, Section 15102 – Triple Offset Metal Seated Butterfly Valve, Part 2 – Materials, Subsection 2.2 Butterfly Valve, Item A, Sub-Item 9, page 204, **DELETE** in its entirety.

D. PLANS

1. To Drawing Number 39739-01-D (Sheet G-1) **DELETE** in its entirety and **REPLACE** with page 10 of this Addendum.
2. To Drawing Number 39739-05-D, (Sheet C-1) **MODIFY** Test Station #1 is located at station 00+87.
3. To Drawing Number 39739-08-D (Sheet C-4) **DELETE** in its entirety and **REPLACE** with page 11 of this Addendum.
4. To Drawing Number 39739-15-D (Sheet C-11) **DELETE** in its entirety and **REPLACE** with page 12 of this Addendum.
5. To Drawing Number 39739-38-D (Sheet CP-1) **MODIFY** Test Station #1 is located at station 00+87.

James Nagelvoort, Director
Public Works Department

Dated: *November 27, 2017*
San Diego, California

JN/RWB/Lad

CONTRACTOR'S RESPONSIBILITIES

- PURSUANT TO SECTION 4216 OF THE CALIFORNIA GOVERNMENT CODE, AT LEAST 2 WORKING DAYS PRIOR TO EXCAVATION, YOU MUST CONTACT THE REGIONAL NOTIFICATION CENTER (E.G., UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA) AND OBTAIN AN INQUIRY IDENTIFICATION NUMBER.
- NOTIFY SDG&E AT LEAST 10 WORKING DAYS PRIOR TO EXCAVATING WITHIN 10' OF SDG&E UNDERGROUND HIGH VOLTAGE TRANSMISSION POWER LINES. (I.E., 69 KV & HIGHER)
- LOCATE AND RECONNECT ALL SEWER LATERALS. LOCATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE ONLY. LATERAL RECORDS ARE AVAILABLE TO THE CONTRACTOR AT THE WATER DEPARTMENT, 2797 CAMINITO CHOLLAS. LOCATE THE IMPROVEMENTS THAT WILL BE AFFECTED BY LATERAL REPLACEMENTS.
- EXCAVATE AROUND WATER METER BOX (CITY PROPERTY SIDE) TO DETERMINE IN ADVANCE THE SIZE OF EACH SERVICE BEFORE TAPPING MAIN.
- CITY FORCES, WHEN SPECIFIED OR SHOWN ON THE PLANS, WILL MAKE PERMANENT CUTS & PLUGS AND CONNECTIONS.
- KEEP EXISTING MAINS IN SERVICE IN LIEU OF HIGH-LINING, UNLESS OTHERWISE SHOWN ON PLANS.
- THE LOCATIONS OF EXISTING BUILDINGS AS SHOWN ON THE PLAN ARE APPROXIMATE.
- STORM DRAIN INLETS SHALL REMAIN FUNCTIONAL AT ALL TIMES DURING CONSTRUCTION.
- UNLESS OTHERWISE NOTED AS PREVIOUSLY POTHOLED (PH), ELEVATIONS SHOWN ON THE PROFILE FOR EXISTING UTILITIES ARE BASED ON A SEARCH OF THE AVAILABLE RECORD INFORMATION ONLY AND ARE SOLELY FOR THE CONTRACTOR'S CONVENIENCE. THE CITY DOES NOT GUARANTEE THAT IT HAS REVIEWED ALL AVAILABLE DATA. THE CONTRACTOR SHALL POTHOLE ALL EXISTING UTILITIES EITHER SHOWN ON THE PLANS OR MARKED IN THE FIELD IN ACCORDANCE WITH THE SPECIFICATIONS SECTION 5-UTILITIES.
- EXISTING UTILITY CROSSINGS AS SHOWN ON THE PLANS ARE APPROXIMATE AND ARE NOT REPRESENTATIVE OF ACTUAL LENGTH AND LOCATION OF CONFLICT AREAS. SEE PLAN VIEW.
- ALL ADVANCE METERING INFRASTRUCTURE (AMI) DEVICES ATTACHED TO THE WATER METER OR LOCATED IN OR NEAR WATER METER BOXES, COFFINS, OR VAULTS SHALL BE PROTECTED AT ALL TIMES IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
- NO JOINTS SHALL BE WITHIN 8' OF CROSSING UTILITIES CONVEYING LIQUIDS OR PARALLEL UTILITIES CONVEYING LIQUIDS THAT ARE 4' OR CLOSER (OUTSIDE PIPE WALL TO OUTSIDE PIPE WALL).

CONSTRUCTION STORM WATER PROTECTION NOTES

- TOTAL SITE DISTURBANCE AREA (ACRES) 0.86 AC
HYDROLOGIC UNIT/WATERSHED PUEBLO SAN DIEGO & SAN DIEGO
HYDROLOGIC SUBAREA NAME & NO CHOLLAS/908.22 & MISSION SAN DIEGO/907.11
- THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE
 WPCP
THE PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT NO. R9-2013-0001 AS AMENDED BY R9-2015-0001 AND R9-2015-0100
 SWPPP
THE PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT NO. R9-2013-0001 AS AMENDED BY R9-2015-0001 AND R9-2015-0100 AND CONSTRUCTION GENERAL PERMIT ORDER 2009-0009-DWQ AS AMENDED BY ORDER 2010-0014-DWQ AND 2012-0006-DWQ
TRADITIONAL: RISK LEVEL 1 2 3
LUP: RISK TYPE 1 2 3
- CONSTRUCTION SITE PRIORITY
 ASBS HIGH MEDIUM LOW

MONUMENTATION/SURVEY NOTES

THE CONTRACTOR SHALL BE RESPONSIBLE FOR SURVEY MONUMENTS AND/OR VERTICAL CONTROL BENCHMARKS WHICH ARE DISTURBED OR DESTROYED BY CONSTRUCTION. A LICENSED LAND SURVEYOR OR LICENSED CIVIL ENGINEER AUTHORIZED TO PRACTICE LAND SURVEYING IN THE STATE OF CALIFORNIA SHALL FIELD LOCATE, REFERENCE, AND/OR PRESERVE ALL HISTORICAL OR CONTROLLING MONUMENTS PRIOR TO ANY EARTHWORK, DEMOLITION OR SURFACE IMPROVEMENTS. IF DESTROYED, A LICENSED LAND SURVEYOR SHALL REPLACE SUCH MONUMENT(S) WITH APPROPRIATE MONUMENTS. WHEN SETTING SURVEY MONUMENTS USE FOR RE-ESTABLISHMENT OF THE DISTURBED CONTROLLING SURVEY MONUMENTS AS REQUIRED BY SECTIONS 6730.2 AND 8771 OF THE BUSINESS AND PROFESSIONS CODE OF THE STATE OF CALIFORNIA. A CORNER RECORD OR RECORD OF SURVEY, AS APPROPRIATE, SHALL BE FILED WITH THE COUNTY SURVEYOR. IF ANY VERTICAL CONTROL IS TO BE DISTURBED OR DESTROYED, THE CITY OF SAN DIEGO FIELD SURVEY SECTION SHALL BE NOTIFIED IN WRITING AT LEAST 7 DAYS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COST OF REPLACING ANY VERTICAL CONTROL BENCHMARKS DESTROYED BY THE CONSTRUCTION.

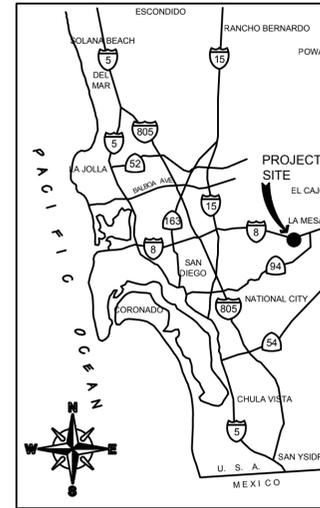
WORK TO BE DONE

- CONSTRUCTION OF NEW 36", 48" AND 66" CML&TC TRANSMISSION MAIN WITH CATHODIC PROTECTION, 8" VC SEWER MAIN, 2-4" FIBER OPTIC CONDUITS, STREET RESURFACING, CURB RAMPS AND ALL OTHER WORK SHOWN HEREIN IN ACCORDANCE WITH THESE SPECIFICATIONS AND DRAWINGS NUMBERED 39739-01-D THROUGH 39739-37-D.

MID-CITY PIPELINE PH 2A

ABBREVIATIONS

ABAND	ABANDON	IJS	INSULATING JOINT TEST STATION
ABAND'D	ABANDONED	IRR	IRRIGATION
ACP	ASBESTOS CEMENT (PIPE)	L&D	LEAD & DISC
AC	ASPHALTIC CONCRETE	LT	LEFT
AHD	AHEAD	MJ	MECHANICAL JOINT
AWTP	ALVARADO WATER TREATMENT PLANT	MPBX	MULTI-POINT BOREHOLE EXTENSOMETER
ASSY	ASSEMBLY	MTD	MULTIPLE TELEPHONE DUCT
AVAR	AIR VACUUM & AIR RELEASE	MTS	METROPOLITAN TRANSIT SYSTEM
BD	BRASS DISK	N.I.C.	NOT IN CONTRACT
BFV	BUTTERFLY VALVE	N/O	NORTH OF
BK	BACK	OVHD	OVERHEAD
BO	BLOWOFF	PE	PLAIN END
BOP	BOTTOM OF PIPE	PH	POTHOLE
BTWN	BETWEEN	PROP	PROPOSED
BW	BACK OF WALK	PVC	POLYVINYL CHLORIDE (PIPE)
CATV	CABLE TV	RCB	REINFORCED CONCRETE BOX
CC	CALCIUM CHLORIDE	RCCP	REINFORCED CONCRETE CYLINDER PIPE
CI	CAST IRON	RCP	REINFORCED CONCRETE PIPE
CICL	CAST IRON CEMENT LINED	RCSC	REINFORCED CONCRETE STEEL CYLINDER
CLSM	CONTROLLED LOW STRENGTH MATERIAL	RED	REDUCER
CML&C	CEMENT LINED & COATED STEEL PIPE	R.O.S.	RECORD-OF-SURVEY
CMLC&TC	CEMENT LINED COATED & TAPE COATED STEEL PIPE	RT	RIGHT
COND	CONDUIT	SD	STORM DRAIN
CONT	CONTINUED	SDCWA	SAN DIEGO COUNTY WATER AUTHORITY
CONTR	CONTRACTOR	SDSD	SAN DIEGO STANDARD DRAWINGS
CPTS	CATHODIC PROTECTION TEST STATION	SL	SEWER LATERAL
DB	DIRECT BURIED	SO	STUB OUT
EB	ENCASED BURIED	S/O	SOUTH OF
ECC	ECCENTRIC	SS	STAINLESS STEEL
EG	EXISTING GRADE	SSMH	SANITARY SEWER MANHOLE
EL, ELEV	ELEVATION	STL	STEEL
ELEC	ELECTRIC	SWR	SEWER
ESMT	EASEMENT	TC	TOP OF CURB
EX, EXIST	EXISTING	TEL	TELEPHONE
E/O	EAST OF	TP	TOP OF PIPE
F	FLANGE	TYP	TYPICAL
FCF	FLOW CONTROL FACILITY	UNK	UNKNOWN
FH	FIRE HYDRANT	VC	VITRIFIED CLAY (PIPE)
FL	FLOW LINE	VERT	VERTICAL
FS	FINISHED SURFACE	WAS	WATER AGENCY STANDARDS
GV	GATE VALVE	WD	WATER DISTRICT
HDPE	HIGH DENSITY POLYETHYLENE	WS	WATER SERVICE
HP	HIGH PRESSURE	WTR	WATER
HWD	HELIX WATER DISTRICT	W/O	WEST OF
IE	INVERT ELEVATION		



VICINITY MAP
NOT TO SCALE

FIELD DATA

BENCHMARK:
NWBP SARANAC STREET AND 69TH STREET, ELEV. 460.779 MSL, BASED ON NGVD 29 FEET AS SHOWN IN THE CITY OF SAN DIEGO BENCH BOOK.

CITY OF SAN DIEGO PRELIMINARY SURVEY FIELD NOTES:
MID-CITY PIPELINE PHASE II, WATKINS, 218-1752, WO. S-11026, 7/10/2013

DATUM: MEAN SEA LEVEL, NGVD 29

BASIS OF BEARINGS:
THE BASIS OF BEARINGS FOR THIS PROJECT WAS DERIVED FROM A PREVIOUS STATIC GPS SURVEY USING ROS 14492, NAD 83 FEET, ZONE 6 (EPOCH 91.35), UTILIZING RTK/GPS FIELD PROCEDURES WITH A CALYRS BASE STATION BROADCAST 2013 AND CONSTRAINING TO GPS 17, GPS 1108 CHECKING GPS 1105, I.E. S 59°07'28" E.

STREETS REQUIRING 12" TRENCH CAP:
NONE

- WATER MAIN & VALVES
- WATER METER/SERVICE LINE
- FIRE HYDRANT
- SEWER MAIN & MANHOLES
- STORM DRAINS
- AC PAVEMENT (PROFILE)
- GROUND LINE (PROFILE)
- CONCRETE SURFACE (PROFILE)
- TRAFFIC SIGNAL
- STREET LIGHT
- GAS MAIN
- ELEC, TEL, OR CATV CONDUIT
- SEWER FORCE MAIN
- RAILROAD, TROLLEY TRACKS

---	FENCE	---
---	RIGHT-OF-WAY	---
○	ELECTRIC VAULT/PEDESTAL	⊗
○	LIGHT FIXTURE	⊗
---	IRRIGATION CONTROL BOX	⊗
---	WATER VAULT/MANHOLE	⊗
---	POWER POLE	⊗
---	GAS VALVE	⊗
⊗	MONITORING WELL	⊗
⊗	TRAFFIC SIGNAL PULLBOX	⊗
---	TELEPHONE VAULT/PEDESTAL	⊗
---	BACKFLOW DEVICE	⊗

LEGEND

IMPROVEMENTS

TRENCH RESURFACING

SEWER MAIN

PIPE SUPPORT FOR UNDERCUT AC WATER MAIN

CUTTING AND PLUGGING ABANDONED WATER MAIN

WATER MAIN & APPURTENANCES

VALVES WITH CAPS AND WELLS

ACCESS MANWAY IN CONCRETE STRUCTURE

BLOWOFF ASSEMBLY

AIR VACUUM & AIR RELEASE VALVE

HIGHLIGHTING BY CONTRACTOR

2-4" FIBER OPTIC CONDUITS AND PULLBOX

WATER MAIN STEEL CASING

CATHODIC PROTECTION TEST STATION

SURVEY WELL MONUMENT

SURVEY MONUMENT

EQUIPMENT CALLOUT WITH POINT NUMBER

REFERENCE

SDG-107, SDG-108 (SEE DETAILS ON DWG C-8)

SDM-105, SDS-110, SDS-112

SDW-162

WP-03

SDM-105, SDW-110, SDW-151, (1500 PSF, 225 PSI)

SDW-109, SDW-152, SDW-153, SDW-154, WV-05

D-9, M-3, SDD-114, SDM-113, SDW-103

SDM-105, SDW-106, SDW-143, SDW-144, SDW-145, SDW-146

4
C-11

3
C-10

SDW-170, SDW-171, SDW-172, SDW-173

SDM-105

SDM-105, SDW-121, SDW-128, SDW-129, SDW-130, SDW-131, SDW-132, SDW-133

M-10, M-10A, M-10B

SYMBOL

101

EXISTING STRUCTURES

G-1

DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS. I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

Michael J. Pollard
MICHAEL J. POLLARD R.C.E 61695 8/15/17 DATE

SAN DIEGO COUNTY WATER AUTHORITY
REVIEWED BY: *Gerard E. Reed, III* 11/15/16 DATE
GERARD E. REED, III DIRECTOR OF ENGINEERING

CONSULTANT
PSOMAS
401 B Street, Suite 1600
San Diego, CA 92101
(619) 961-2800 (619) 961-2392 fax
www.psomas.com

PLANS FOR THE CONSTRUCTION OF
MID-CITY PIPELINE PH 2A
COVER SHEET

AS-BUILT INFORMATION	
MATERIALS	MANUFACTURER
PIPE CL 235 (WATER)	-
PIPE SDR 35 (SEWER)	-
GATE VALVES	-
FIRE HYDRANTS	-
SEWER MANHOLES	-
REHABILITATE SEWER MANHOLES	-
REHABILITATE SEWER MAIN	-

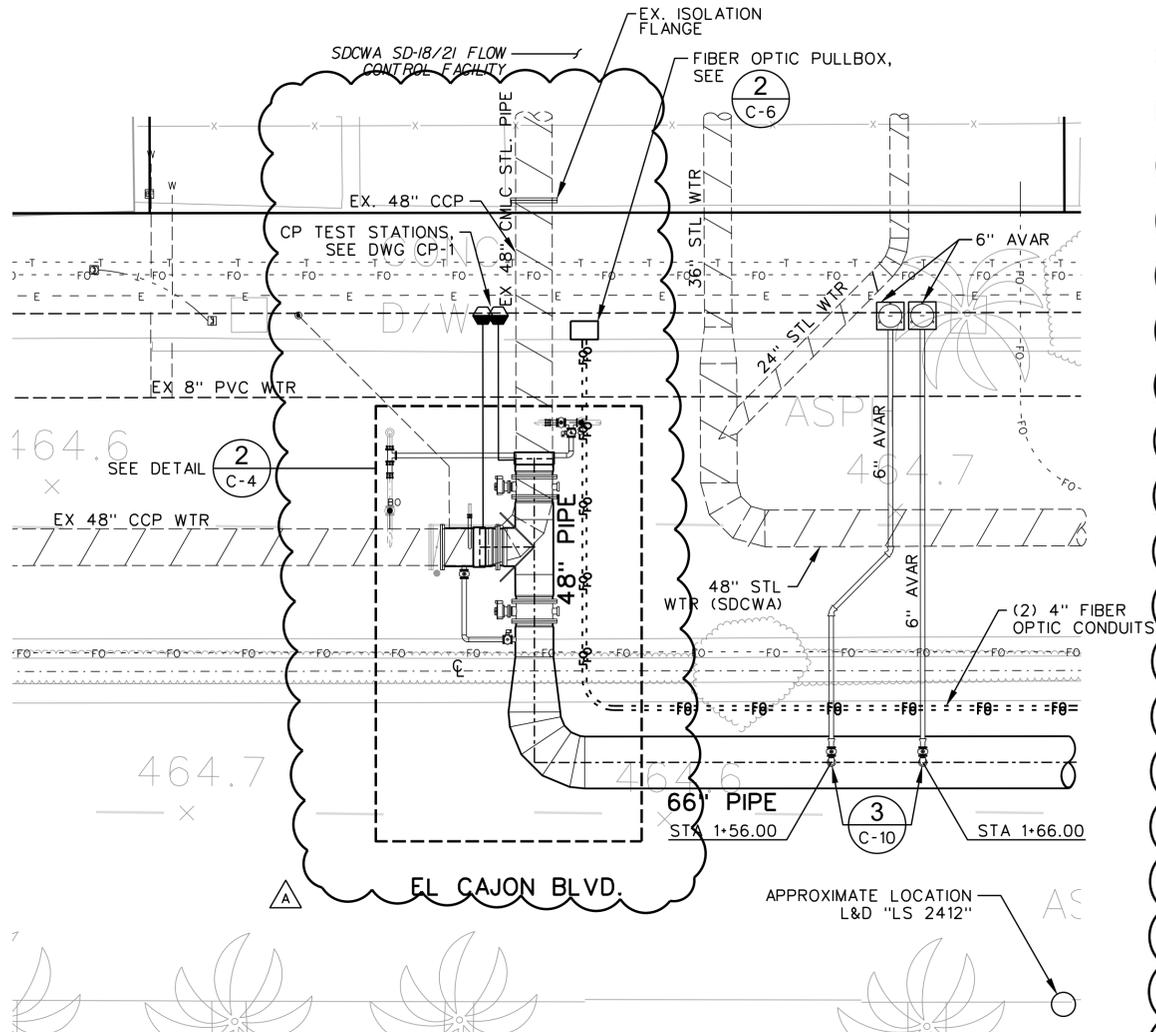
SPEC NO. 1545
CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 1 OF 39 SHEETS
APPROVED: *Brian Vitelle* 10/10/2017 DATE
FOR CITY ENGINEER: BRIAN VITELLE C73039 DATE
PRINT DCE NAME: RCE #
8/15/17
CONTRACTOR INSPECTOR

WATER WBS	B-17081			
SEWER WBS	N/A			
PROJECT MANAGER	MARYAM KARGAR			
CHECKED BY	JACOB RIVERA			
PROJECT ENGINEER	JACOB RIVERA			
DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	PSO			
SEE SHEETS CCS27 COORDINATE				
SEE SHEETS CCS83 COORDINATE				
DATE STARTED				39739-01-D
DATE COMPLETED				

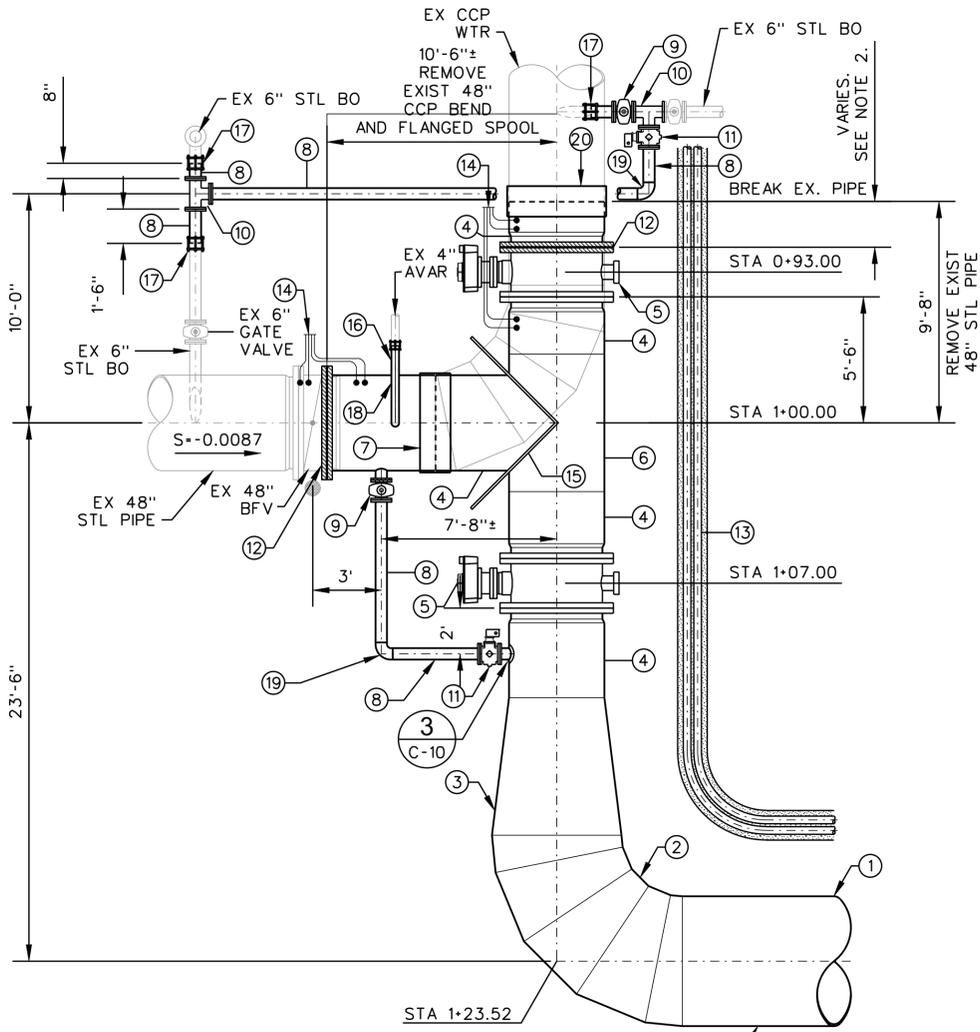
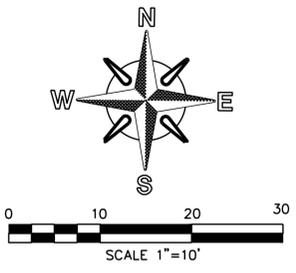
CONSTRUCTION CHANGE / ADDENDUM			
CHANGE	DATE	AFFECTED OR ADDED SHEET NUMBERS	APPROVAL NO.
▲	11/21/17	C-4 (39739-8-D), C-11 (39739-15-D)	

WARNING
0 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

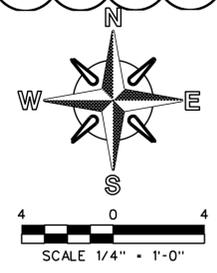




AREA ENLARGEMENT AT EL CAJON BLVD NEAR SDCWA FCF (1) C-4



BEGIN CONTRACT CONNECTION AT STA. 1+00.00 - EL CAJON BOULEVARD (2) C-4



- CONSTRUCTION ITEMS**
- ① 66" CMLC&TC STL PIPE
 - ② 66" 5-PIECE CMLC&TC STL 90° BEND (PE) R=D, DIMENSIONS PER AWWA C208
 - ③ 66"x48" CMLC&TC STL ECCENTRIC REDUCER (PE) TOP FLAT
 - ④ 48" CMLC&TC STL SPOOL (F,PE)
 - ⑤ 48" BFV (F)
 - ⑥ 48" CMLC&TC STL TEE (PE)
 - ⑦ 48" BUTT STRAP PER (3) C-9
 - ⑧ 6" CMLC&TC BYPASS PIPE
 - ⑨ 6" GATE VALVE (F)
 - ⑩ 6" CMLC&TC STL TEE (F)
 - ⑪ 6" PLUG VALVE (F)
 - ⑫ FLANGE INSULATING KIT PER (4) CP-2
 - ⑬ 2 - 4" FIBER OPTIC CONDUITS PER (3) C-6
 - ⑭ INSULATING JOINT TEST STATION, SEE TABLE ON CP-1
 - ⑮ CROTCH PLATE PER (4) C-10
 - ⑯ 4" CMLC&TC STL PIPE OUTLET WITH 4" FLEXIBLE COUPLING, CONNECT TO EXISTING 4" AVAR PIPING.
 - ⑰ 6" FLEXIBLE COUPLING
 - ⑱ 4" AVAR OUTLET PER (3) C-10
 - ⑲ 6" 90° ELBOW (PE)
 - ⑳ CONNECTION TO EX. CCP. SEE DETAIL (5) C-11

- CONSTRUCTION ITEMS**
- 1. DIMENSIONS SHOW ARE APPROXIMATE. PRIOR TO ORDERING MATERIALS FOR CONNECTING TO THE EXISTING PIPELINE, THE CONTRACTOR SHALL FIELD VERIFY DIMENSIONS.
 - 2. WHEN CONNECTING TO EXISTING CCP, LOCATE THE NEAREST JOINT AND BREAK THE PIPE IN THIS LOCATION. DO NOT CUT THE CCP

CONNECTION DETAILS

C-4

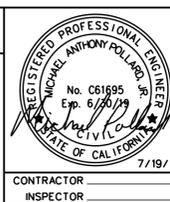
MID-CITY PIPELINE PH 2A
CONNECTION DETAILS

CITY OF SAN DIEGO, CALIFORNIA PUBLIC WORKS DEPARTMENT SHEET 8 OF 39 SHEETS		WATER WBS B-17081 SEWER WBS N/A
APPROVED FOR CITY ENGINEER BRIAN VITELLE PRINT DCE NAME	DATE 10/10/2017 C73039 RCE #	SUBMITTED BY MARYAM KARGAR PROJECT MANAGER CHECKED BY JACOB RIVERA PROJECT ENGINEER
DESCRIPTION	BY	APPROVED
ORIGINAL	PSO	
ADDENDUM A	PSO	11/22/17
DATE STARTED		DATE COMPLETED
		39739-08-D

CONSULTANT

PSOMAS

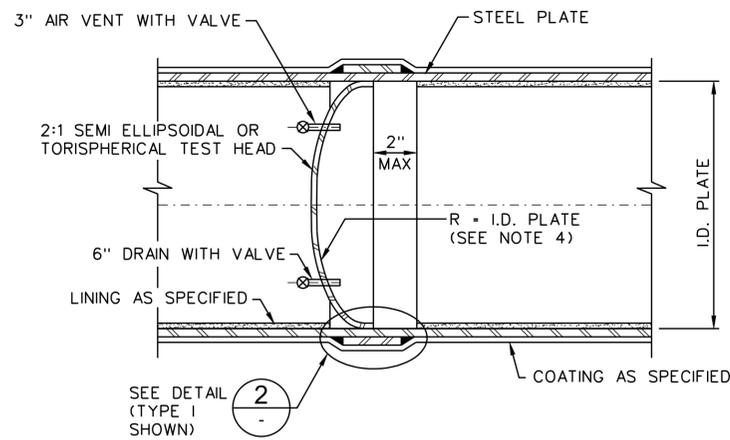
401 B Street, Suite 1600
San Diego, CA 92101
(619) 961-2800 (619) 961-2392 fax
www.psomas.com



CONTRACTOR INSPECTOR DATE STARTED DATE COMPLETED

REVISION CONNECTION DETAILS

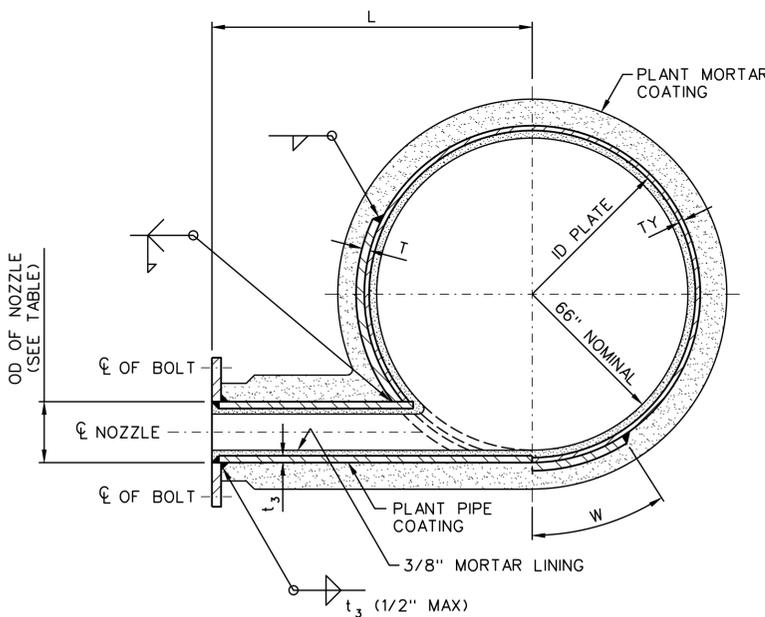
ADDENDUM A



BULKHEAD NOTES:

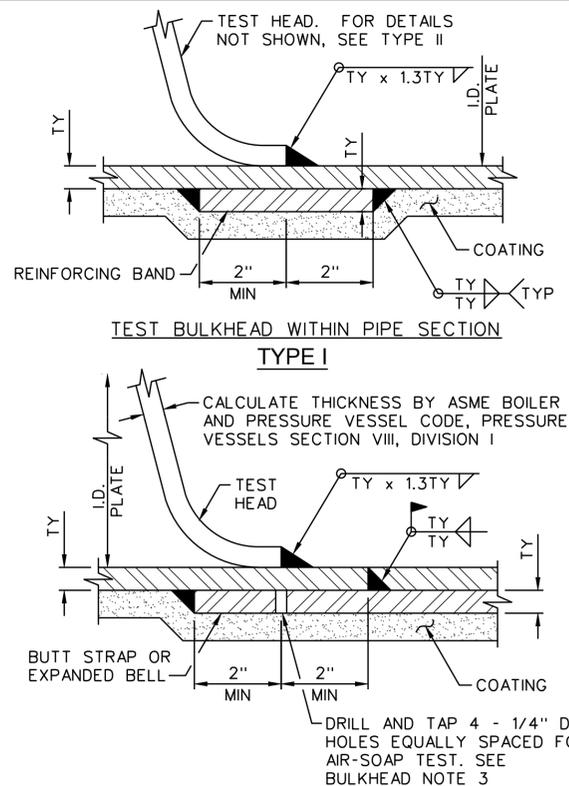
1. FOR INSIDE DIAMETER AND PLATE THICKNESS OF WELDED STEEL PIPE, SEE PLAN AND PROFILE DRAWINGS.
2. "TY" INDICATES THE THICKNESS OF THE STEEL PLATE.
3. BEFORE WELDING, DRILL AND TAP TEST HOLES. AIR AND SOAP TEST AFTER WELDING IS COMPLETED. PLUG WELD HOLES AFTER SUCCESSFUL COMPLETION OF JOINT TESTS.
4. RADIUS SHOWN FOR TEST BULKHEAD APPLIES TO TORISPHERICAL HEAD ONLY.
5. CONTRACTOR SHALL HAVE THE OPTION OF TYPE I OR TYPE II BULKHEAD INSTALLATION.
6. SEE SPEC FOR CEMENT MORTAR COATING HOLD BACK DIMENSION.

TEST BULKHEAD
NOT TO SCALE



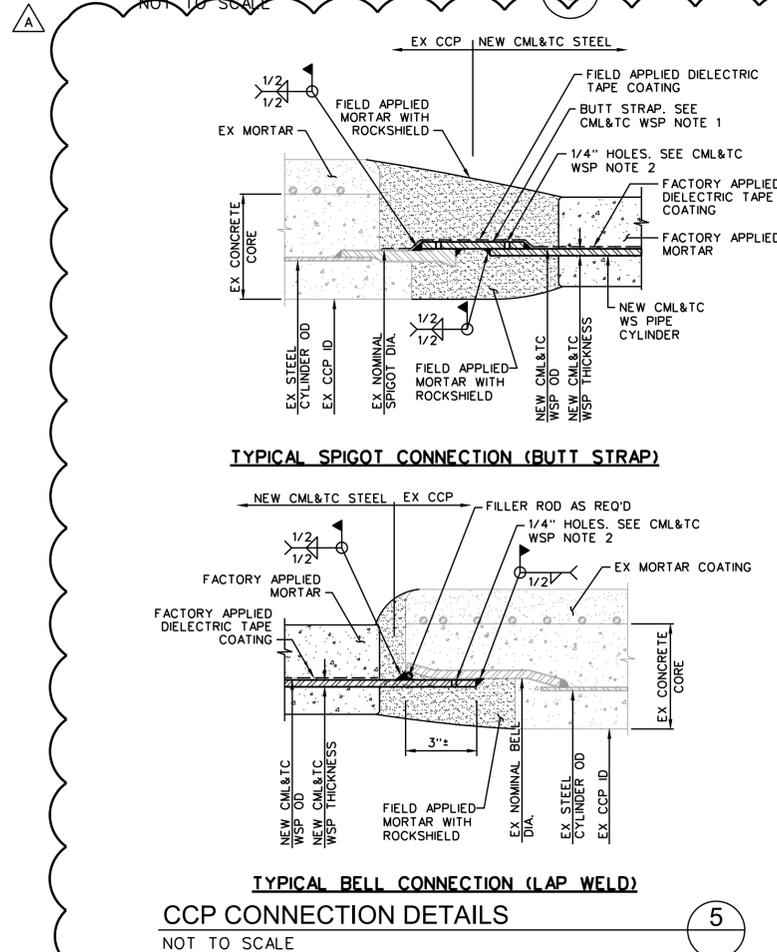
NOZZLE REINFORCING COLLAR DATA						
NOMINAL SIZE	SCHEDULE PIPE	WALL THICKNESS (t ₃)	OD NOZZLE	COLLAR DIMENSIONS		
				W	T	L
6	80	7/16"	7-5/8"	6"	7/16"	42"

TANGENTIAL OUTLET FOR BLOWOFF ASSEMBLIES
NOT TO SCALE

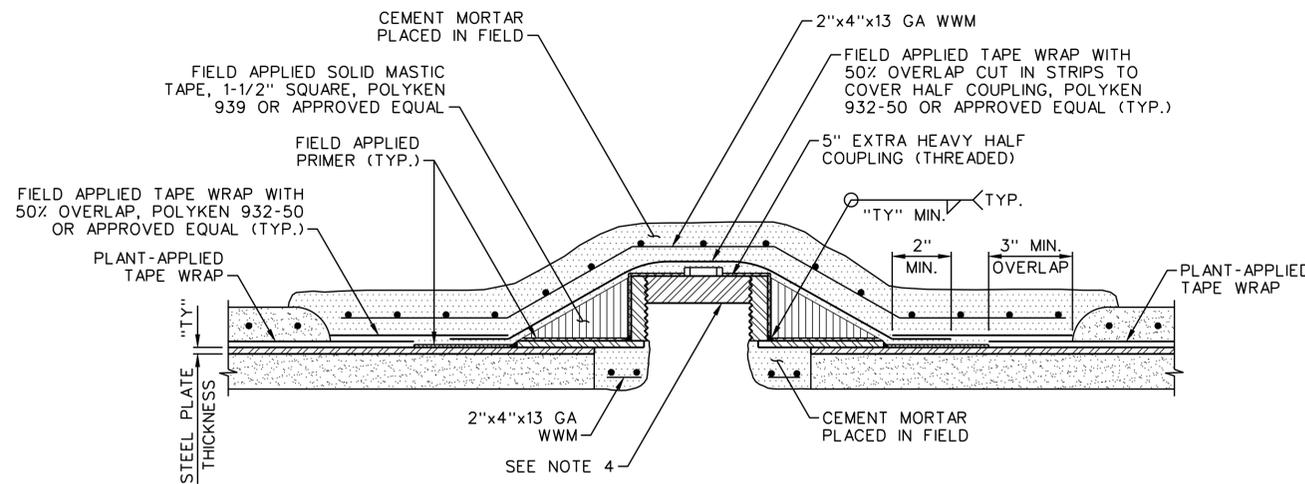


TEST BULKHEAD AT PIPE JOINT
TYPE II

TEST BULKHEAD DETAIL
NOT TO SCALE



TYPICAL BELL CONNECTION (LAP WELD)
CCP CONNECTION DETAILS
NOT TO SCALE



NOTES:

1. ONLY USE HAND HOLES IF AN ACCESS MANWAY IS NOT WITHIN A REASONABLE DISTANCE.
2. BUTT STRAPS TO BE FURNISHED IN TWO PIECES AND SHIPPED LOOSE FOR FIELD JOINING. (BACKUP PLATE SHALL BE 1/4" THICK x 1" WIDE).
3. 14" MAXIMUM LENGTH OF BUTT STRAP FOR FIELD CLOSING SECTION.
4. FOR PIPING 36" AND LARGER, FOUR HAND HOLES ARE REQUIRED FOR EACH BUTT STRAP JOINT AND SHALL BE LOCATED 90° APART.
5. WELD PLUG TO COUPLING AND CEMENT MORTAR LINE OR COAT EXPOSED INTERIOR METAL SURFACES WITH 11 MILS (MIN) EPOXY COATING IN FIELD.
6. THE ABOVE DETAIL IS SCHEMATIC IN NATURE AND IS PRESENTED HERE TO CLARIFY INSTALLATION OF FIELD APPLIED TAPE WRAP. THERE SHALL BE NO AIR POCKETS UNDER FIELD APPLIED TAPE WRAPS.

BUTT STRAP HAND HOLE
NOT TO SCALE

CML&TC WSP NOTES

1. BUTT STRAPS USED TO CONNECT TO EXISTING CCP SHALL BE HAVE AN ID APPROXIMATELY 1/8" GREATER THAN OD OF NEW CML&TC STEEL PIPE. ADD FIELD APPLIED DIELECTRIC TAPE COATING TO BUTT STRAPS AND EXPOSED STEEL PRIOR TO APPLYING MORTAR.
2. BEFORE WELDING, DRILL AND TAP (4) 1/4" EQUALLY SPACED HOLES FOR AIR-SOAP TEST. CONTRACTOR TO PLUG HOLES AFTER SUCCESSFUL COMPLETION OF TESTS.
3. SURFACES TO BE WELDED SHALL BE CLEANED BY WIRE BRUSHING OR SANDBLASTING PRIOR TO WELDING.
4. WELD LONGITUDINAL WELDS BEFORE GIRTH WELDS.
5. CONNECTION SPACING BETWEEN EXISTING AND NEW PIPE MAY VARY. CONTRACTOR SHALL BE RESPONSIBLE FOR FINAL FIT UP BASED ON ACTUAL CONDITIONS.
6. FILLER BANDS MAY BE REQUIRED TO PROVIDE SUFFICIENT THICKNESS AND ALIGNMENT AND SHALL BE ONSITE DURING CONSTRUCTION IF NEEDED.
7. EXISTING PIPE DIMENSIONS AND JOINT LOCATIONS TO BE VERIFIED BY CONTRACTOR.
8. THE TYPE OF CONNECTION THAT WILL BE REQUIRED TO CONNECT TO THE END OF THE EXISTING CCP IS NOT KNOWN. CONTRACTOR SHALL DETERMINE IN THE FIELD WHEN THE EXISTING PIPE IS EXPOSED AND CUT, WHETHER TO IMPLEMENT THE "SPIGOT CONNECTION" OR THE "BELL CONNECTION" DETAIL.

TYPICAL THIS SHEET:
1. FOR "TY" DIMENSION, SEE TABLE ON C-9

CONSULTANT
PSOMAS
401 B Street, Suite 1600
San Diego, CA 92101
(619) 961-2800 (619) 961-2392 fax
www.psomas.com

REGISTERED PROFESSIONAL ENGINEER
MICHAEL ANTHONY POLLARD
No. C61695
Exp. 6/30/19
STATE OF CALIFORNIA
7/19/17

MID-CITY PIPELINE PH 2A
STEEL PIPE DETAILS

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 15 OF 39 SHEETS

WATER WBS B-17081
SEWER WBS N/A

APPROVED: *Brian Vitelle* 10/10/2017
DATE FOR CITY ENGINEER: 10/10/2017
DATE: C73039
PROJECT MANAGER: MARYAM KARGAR
PROJECT ENGINEER: JACOB RIVERA
CHECKED BY: JACOB RIVERA

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	PSO			
ADDENDUM A	PSO	<i>Brian Vitelle</i>	11/22/17	

DATE STARTED
DATE COMPLETED

39739-15-D

REMOVE CONNECTION DETAIL

ADDENDUM A

Bid Results

Bidder Details

Vendor Name TC Construction Company, Inc.
Address 10540 Prospect Avenue
 Santee, CA 92071
 United States
Respondee Austin Cameron
Respondee Title President
Phone 619-448-4560 Ext. 117
Email acameron@tcincsd.com
Vendor Type CAU,MALE,PQUAL,CADIR,Local
License # 402459
CADIR 1000003132

Bid Detail

Bid Format Electronic
Submitted December 12, 2017 1:49:57 PM (Pacific)
Delivery Method
Bid Responsive
Bid Status Submitted
Confirmation # 124742
Ranking 0

Respondee Comment

Buyer Comment

Attachments

File Title	File Name	File Type
Contractors Cert of Pending Actions	Contractors Certification of Pending Actions Mid City Pipeline.pdf	Contractor's Certification of Pending Actions
Bid Bond Mid City Pipeline	Bid Bond Mid City Pipeline.pdf	Bid Bond

Line Items

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment	Reference
	Main Bid						
1	Bonds (Payment and Performance)						
	524126	LS	1	\$50,000.00	\$50,000.00		2-4.1
2	Archeological and Native American Monitoring Program						
	541690	LF	820	\$10.00	\$8,200.00		6-3.2.2.1
3	Suspension of Work - Resources						
	541690	DAY	5	\$300.00	\$1,500.00		6-3.2.2.1
4	Paleontological Monitoring Program						
	541690	LF	820	\$10.00	\$8,200.00		6-3.2.3.1
5	Archeological and Native American Mitigation and Curation - (EOC Type I)						
	541690	AL	1	\$2,500.00	\$2,500.00		6-3.2.4.1

Bid Results

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment	Reference
6	Paleontological Mitigation and Excavation						
	541690	CY	1900	\$4.00	\$7,600.00		6-3.2.5.1
7	San Diego County Water Authority Permit (EOC Type II)						
	236220	AL	1	\$1,000.00	\$1,000.00		7-5.3
8	Sewage Bypass and Pumping Plan (Diversion Plan)						
	237110	LS	1	\$500.00	\$500.00		7-8.5.4
9	WPCP Development						
	541330	LS	1	\$1,100.00	\$1,100.00		7-8.6.4.2
10	WPCP Implementation						
	237990	LS	1	\$36,000.00	\$36,000.00		7-8.6.4.2
11	Dewatering Permit and Discharge Fees - Type I						
	237110	AL	1	\$500.00	\$500.00		7-8.6.6.9
12	Dewatering - Non-Hazardous Contaminated Water						
	237110	LS	1	\$22,000.00	\$22,000.00		7-8.6.6.9
13	Video Recording of Existing Conditions						
	238990	LS	1	\$2,000.00	\$2,000.00		7-9.1.1
14	Exclusive Community Liaison Services						
	541820	LS	1	\$20,000.00	\$20,000.00		7-16.4
15	Preparation of Waste Management Form						
	238910	LS	1	\$300.00	\$300.00		7-21.9
16	Site Storage and Handling of Construction and Demolition Waste						
	238910	TN	637.5	\$5.00	\$3,187.50		7-21.9
17	Disposal of Construction and Demolition Waste						
	238910	TN	637.5	\$10.00	\$6,375.00		7-21.9
18	Preparation of Hazardous Waste Management Plan and Reporting						
	238990	LS	1	\$9,000.00	\$9,000.00		7-22.20
19	Monitoring Contaminated Soil						
	541690	LS	1	\$2,200.00	\$2,200.00		7-22.20
20	Testing, Sampling, Site Storage and Handling of Petroleum Contaminated Soil						
	238990	TN	1	\$2,200.00	\$2,200.00		7-22.20
21	Loading, Transportation, and Disposal of Petroleum Contaminated Soil						
	238990	TN	1	\$2,300.00	\$2,300.00		7-22.20

Bid Results

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment	Reference
22	Installation of Insulating Joint Cathodic Protection Test Station						
	238190	EA	3	\$8,000.00	\$24,000.00		
23	Installation of Casing Cathodic Protection Test Station						
	238190	EA	2	\$2,400.00	\$4,800.00		
24	Salvage SCADA and Transport to Chollas						
	237110	LS	1	\$56,000.00	\$56,000.00		9.3.1
25	Mobilization						
	237110	LS	1	\$160,000.00	\$160,000.00		9-3.4.1
26	Field Orders - (EOC - Type II)						
		AL	1	\$284,018.00	\$284,018.00		9-3.5
27	Adjusting Existing Gate Valve Frame and Cover to Grade						
	237310	EA	2	\$600.00	\$1,200.00		301-1.7
28	Cold Mill AC Pavement (> 1½ inch - 3 inch)						
	237310	SF	22758	\$1.00	\$22,758.00		302-1.12
29	Asphalt Pavement Repair (69th Street)						
	237310	TON	185	\$350.00	\$64,750.00		302-3.2
30	Asphalt Concrete Overlay (2-Inch)						
	237310	SF	22758	\$1.50	\$34,137.00		302-5.9
31	Pavement Fabric						
	237310	SY	2550	\$6.00	\$15,300.00		302-7.4
32	Curb Inlet (Type D25)						
	237110	EA	1	\$4,800.00	\$4,800.00		303-1.11
33	Manholes (5'x7' Access Manways)						
	237110	EA	1	\$30,000.00	\$30,000.00		303-1.11
34	Contractor Date Stamp and Impressions						
	237310	EA	11	\$200.00	\$2,200.00		303-5.9
35	Curb and Gutter (6-Inch Curb, Type B1)						
	237310	LF	22	\$53.00	\$1,166.00		303-5.9
36	Cross Gutter						
	237310	SF	580	\$23.00	\$13,340.00		303-5.9
37	Alley Apron						
	237310	SF	560	\$20.00	\$11,200.00		303-5.9

Bid Results

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment	Reference
38	Curb Ramp Type A with Stainless Steel Detectable Warning Tiles (Dwgs. 39739-20 and -22-D.)						
	237310	EA	4	\$4,100.00	\$16,400.00		303-5.10.2
39	Curb Ramp Type A with Stainless Steel Detectable Warning Tiles (NE corner of El Cajon/69th, Dwg. 39739-20)						
	237310	EA	1	\$5,000.00	\$5,000.00		303-5.10.2
40	Curb Ramp Type A with Stainless Steel Detectable Warning Tiles (SE corner of 69th/Mohawk) (Dwg. 39739-22-D)						
	237310	EA	1	\$4,800.00	\$4,800.00		303-5.10.2
41	Curb Ramp Type C1 with Stainless Steel Detectable Warning Tiles						
	237310	EA	1	\$3,700.00	\$3,700.00		303-5.10.2
42	Curb Ramp Type D with Stainless Steel Detectable Warning Tiles						
	237310	EA	4	\$3,100.00	\$12,400.00		303-5.10.2
43	Curb Ramp Barricade						
	237310	EA	2	\$1,000.00	\$2,000.00		701-2
44	Additional Bedding						
	237110	CY	100	\$80.00	\$8,000.00		306-15.1
45	Temporary Resurfacing						
	237310	TON	216	\$135.00	\$29,160.00		306-15.9
46	Trench Shoring						
	237110	LS	1	\$70,000.00	\$70,000.00		306-15.2
47	Imported Backfill For Trench						
	237110	TON	1500	\$40.00	\$60,000.00		306-15.12
48	Water Main (36-Inch, Welded Steel)						
	237110	LF	10	\$5,000.00	\$50,000.00		306-15.1
49	Water Main (48-Inch, Welded Steel)						
	237110	LS	1	\$150,000.00	\$150,000.00		306-15.1
50	Water Main (66-Inch, Welded Steel)						
	237110	LF	720	\$2,700.00	\$1,944,000.00		306-15.1
51	Triple Offset Butterfly Valve (36-Inch, 150 psi rated)						
	237110	EA	1	\$90,000.00	\$90,000.00		306-15.5
52	Triple Offset Butterfly Valve (48-Inch, 150 psi rated)						
	237110	EA	2	\$168,000.00	\$336,000.00		306-15.5
53	Triple Offset Butterfly Valve (66-Inch, 150 psi rated)						
	237110	EA	2	\$370,000.00	\$740,000.00		306-15.5

Bid Results

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment	Reference
54	Water Valve Bypass for T-Mainline 16 Inch and Larger						
	237110	EA	2	\$40,000.00	\$80,000.00		306-15.5
55	Water Valve Bypass for Straight Mainline 16-Inch and Larger						
	237110	EA	1	\$40,000.00	\$40,000.00		306-15.5
56	Sewer Main Vitrified Clay Pipe (8-Inch, Concrete Encased)						
	237110	LF	40	\$600.00	\$24,000.00		306-15.1
57	Blow-off Valve Assembly (6-Inch)						
	237110	EA	3	\$40,000.00	\$120,000.00		306-15.8
58	Air and Vacuum (Air Release) Valve Assembly (6-Inch, Class 150)						
	237110	EA	3	\$40,000.00	\$120,000.00		306-15.8
59	Trenchless Crossing at El Cajon Blvd.						
	237110	LS	1	\$760,000.00	\$760,000.00		307-2.10
60	Painted Traffic Stripes and Painted Curb Markings						
	237310	LF	1500	\$2.50	\$3,750.00		314-4.3.7
61	Continental Crosswalks						
	237310	SF	1050	\$3.75	\$3,937.50		314-4.4.6
62	Retroreflective Pavement Markers						
	237310	EA	15	\$15.00	\$225.00		314-5.7
63	Traffic Control						
	237310	LS	1	\$140,000.00	\$140,000.00		601-6
64	4" PVC Fiber Optic Conduit and Pullboxes						
	237110	LF	1640	\$100.00	\$164,000.00		701-2
65	Electrical Work						
	238210	LS	1	\$210,000.00	\$210,000.00		
66	Cathodic Protection						
	237110	LS	1	\$11,000.00	\$11,000.00		
67	Landscape Repairs						
	561730	LS	1	\$32,000.00	\$32,000.00		801-9
68	Biological Monitoring and Reporting						
	541330	LS	1	\$6,000.00	\$6,000.00		802-5
69	Connections to existing system by Contractor (48 Inches)						
	237110	EA	2	\$11,000.00	\$22,000.00		901-2.5

Bid Results

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment	Reference
70	Pavement Restoration for Final Connection						
	237110	SF	800	\$15.00	\$12,000.00		901-2.5
Subtotal					\$6,186,704.00		
Total					\$6,186,704.00		

Subcontractors

Name & Address	Description	License Num	CADIR	Amount	Type
Loveless & Linton Consulting-Archaeological 1421 W. Lewis St San Diego, CA 92103 United States	Archeo/Native American Monitoring Consultant SLBE	N/A	1000047263	\$19,315.00	NAT,MALE,SLBE,DBE,MBE,CADIR,SDB
Soclaris Contracting 7437 Lowell Ct. La Mesa, CA 91942 United States	Contaminated Soil Test & Disposal Constructor SLBE ELBE	793838	1000011964	\$14,000.00	CAU,MALE,SLBE,DVBE,CADIR,SDVSB
McGrath Consulting PO BOX 2488 El Cajon, CA 92021 United States	WPCP Consultant ELBE	N/A	1000037165	\$550.00	ELBE,SDB
Payco Specialties Inc. 120 North Second Ave Chula Vista, CA 91910 United States	Striping & Marking Constructor	298637	1000003515	\$6,915.00	CAU,FEM,PQUAL,MBE,SDB,WBE,WOSB
MIRAMAR GENERAL ENGINEERING 5595 Magnatron Blvd. Suite P San Diego, CA 92111 United States	Concrete Flatwork Constructor ELBE	1009541	1000033057	\$68,696.00	ELBE,PQUAL
Maxim Construction Co., Inc. 8005 Royal Gardens Place El Cajon, CA 92021 United States	Watermain Construction-Partial Constructor ELBE	1000689	1000048900	\$1,262,600.00	Asian,ELBE,FEM,WOSB
Vic Salazar Communications 5205 Kearny Villa Road Suite 107 San Diego, CA 92130 United States	Community Liaison Consultant ELBE	00000	N/A	\$18,000.00	DBE,ELBE,LAT,MAL E,MBE
Southern Contracting Company 559 North Twin Oaks Valley Road San Marcos, CA 92069 United States	Electrical Instrumentation Constructor	222252	1000002172	\$140,000.00	PQUAL
Golden State Boring & Pipe Jacking Inc. 7000 Merrill Ave. Box 40 Chino, CA 91710 United States	Jack & Bore & Permeation Grouting Constructor	678500	1000005788	\$454,600.00	