INVITATION FOR BIDS

FOR CONSTRUCTING

GEYSERS - DELTA CONNECTION IMPROVEMENTS

CONTRACT NUMBER
C02111

ISSUED BY

CAPITAL PROJECTS ENGINEERING DIVISION

CITY OF SANTA ROSA, CALIFORNIA

2022

Last Updated: March 1, 2016

A T T E N T I O N
Prebid Conference
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City of Santa Rosa

STATE OF CALIFORNIA

INVITATION FOR BIDS

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CONTRACT

FOR

GEYSERS - DELTA CONNECTION IMPROVEMENTS

Contract No. C02111

GEYSERS - DELTA CONNECTION IMPROVEMENTS

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CITY OF SANTA ROSA
STATE OF CALIFORNIA

NOTICE TO BIDDERS

➢	For technical questions regarding this project, contact Andrew Wilt at (707) 543-3878.
➢	For direct access to plans, specifications and planholders' lists, go to www.srcity.org/bids and click on Bid/Proposal Opportunities or call (707) 543-3800.
➢	For direct access to bid results, go to www.srcity.org/bids. Under Link to Capital Projects, click on Capital Projects Contracts.

- IMPORTANT -

REVISED BIDDING PROCEDURES

All bids shall be submitted and opened according to the following procedure:

Bid Acceptance Deadline

Sealed bids will be accepted at the Transportation and Public Works Department, 69 Stony Circle, Santa Rosa, California 95401 until 2:00 p.m., June 1, 2022, for Geysers - Delta Connection Improvements, Contract No. C02111. (Engineer's Estimate: $1,456,610).

Bids tendered after this deadline will not be accepted. The official time clock for accepting bids will be an electric date and time stamping clock, located in the Transportation and Public Works Department, 69 Stony Circle, Santa Rosa, California. In order to be accepted, bids must be received prior to 2:00 p.m. Therefore, a bid stamped in at 1:59 p.m. will be accepted, but one delivered at or after 2:00 p.m. is late and will not be accepted.

Project Description/Scope of Work

Upsize the connection between Delta Pond and the existing 33" Geysers Line which ends just outside the toe of the pond. The length needs to be upsized is approximately 130 feet from 12" to approximately 24". Upsizing this connection will allow recycled water to be delivered to Delta Pond using the Geysers pipeline in the event that the aged reclamation piping network is compromised and will provide redundancy.

Optional Pre-Bid Meeting

Prospective bidders, subcontractors, and material suppliers are invited to attend a pre-bid meeting scheduled to be held at 10:00 a.m., May 25, 2022, at 727 Willowside Road, Santa Rosa, California

Bid Opening Teleconference Call

Prospective bidders, subcontractors, and materials suppliers are invited to attend the Bid opening teleconference call scheduled to be held at 2:00 p.m., June 1, 2022. The teleconference can be accessed by dialing 1 (707) 543-4700, participant code 029-7567#.

Subcontractor Information; Department of Industrial Relations Registration

Bidders shall provide the names, business addresses and license numbers of all subcontractors listed on bidder's List of Subcontractors. No contractor or subcontractor may be listed on a bid for this public works project unless registered with the Department of Industrial Relations (DIR) pursuant to Labor Code section 1725.5. No contractor or subcontractor may be awarded a contract for this public works project unless registered with the DIR pursuant to Labor Code section 1725.5. This public works project is subject to compliance monitoring and enforcement by the DIR.

CITY OF SANTA ROSA
C02111 GEYSERS - DELTA CONNECTION IMPROVEMENTS
ESTIMATED QUANTITIES

Item No.	Description	Quantity	Units
1	MOBILIZE, DEMOBILIZE, AND SITE PREPARATION	1	LS
2	ARCHAEOLOGICAL AND BIOLOGICAL MONITORING COORDINATION	1	LS
3	TEMPORARY CONSTRUCTION FENCING	675	LF
4	CLEANUP AND EROSION CONTROL	1	LS
5	EMBANKMENT EXCAVATION (F)	630	CY
6	EMBANKMENT AND MISCELLANEOUS FILL (F)	730	CY
7	IMPORT MISCELLANEOUS FILL MATERIAL	250	CY
8	MAIN TIE-IN	1	LS
9	24" DUCTILE IRON PIPE, FITTINGS, AND APPURTENANCES	1	LS
10	CONCRETE PIPE ENCASEMENT	62	LF
11	24" MAG METER, VAULT, AND COVER	1	LS
12	24" BUTTERFLY VALVE	1	LS
13	12" KNIFE GATE VALVE	1	LS
14	12" FIXED-CONE DISPERSION VALVE WITH HOOD	1	LS
15	STAINLESS STEEL DISCHARGE PIPING AND APPURTENANCES	1	LS
16	DISCHARGE STRUCTURE, SPILLWAY, AND STILLING BASIN	1	LS
17	BUTTERFLY VALVE REPLACEMENT	1	LS
18	OUTLET FLOW METER REPLACEMENT	1	LS
19	ELECTRICAL FROM DELTA POND PUMP STATION TO PEDESTAL	1,850.00	LF
20	ELECTRICAL AND CONTROLS PEDESTAL	1	LS
21	GENERAL ELECTRICAL WORK	1	LS
22	ROCK RIPRAP AND GEOTEXTILE	570	SY
23	GRAVEL ROADWAY CONSTRUCTION	860	SF
24	CHAIN LINK FENCE	72	LF
25	DEWATERING, TRENCHING SHORING, AND BRACING	1	LS

The foregoing quantities are approximate only, being given as a basis for the comparison of bids, and the City of Santa Rosa does not expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work, as may be deemed necessary or expedient by the Engineer.

Bids shall be made in accordance with the prevailing hourly rate of per diem wages for this locality and project as determined by the Director of the DIR pursuant to Labor Code sections 1770 *et seq*.

Contractor shall be responsible for compliance with the Immigration Reform Control Act of 1986.

If the project requires the employment of workers in any apprenticeable craft or trade, once awarded, Contractor and subcontractors must apply to the Joint Apprenticeship Council unless already covered by local apprentice standards (see Labor Code section 1777.5).

All bids are to be compared on the basis of the Engineer's estimate of the quantities of work to be performed. No bid will be awarded to a contractor who is not licensed in accordance with the provisions of Chapter 9 of Division 3 of the Business and Professions Code. Contractor must hold a Class A license for this project.

Project plans, bid and contract forms for C02111 Geysers - Delta Connection Improvements may be obtained through PlanetBids at www.srcity.org/bids. These documents can no longer be obtained at the Transportation and Public Works Department.

No bid will be accepted unless it is made on the contract bid forms furnished by the Transportation and Public Works Department through PlanetBids. The original of the completed bid forms bearing original signatures must be submitted. A bid will not be accepted unless the bidder registers as a vendor through PlanetBids at www.srcity.org/bids, downloads documents/attachments, and is added to the prospective bidders list for this project. If there is an addendum, bidders must log into PlanetBids and acknowledge the addendum to be eligible for bidding.

The successful bidder will be required to hold a current City of Santa Rosa business tax certificate issued pursuant to Chapter 6.04 of the Santa Rosa City Code before commencing work on this project. For information regarding the business tax, contact Revenue and Collections at (707) 543-3170.

For any moneys earned by Contractor and withheld by the City of Santa Rosa to ensure the performance of the Contract, Contractor may, at its request and expense, substitute securities equivalent to the amount withheld in the form and manner and subject to the conditions provided in Section 22300 of the California Public Contract Code.

The City of Santa Rosa reserves the right to reject any or all bids and the right to waive minor irregularities or informalities in any bid or bonds.

5/11/22

TRACY DUENAS
Supervising Engineer

Date

SPECIAL PROVISIONS

General Specifications

CITY OF SANTA ROSA, CALIFORNIA

GEYSERS - DELTA CONNECTION IMPROVEMENTS

1 GENERAL

The work described herein shall be done in accordance with the "Contract Documents," which are the:

1. Special Provisions
2. Project Plans, consisting of 27 sheets entitled Geysers - Delta Connection Improvements, 2018-0048
3. City of Santa Rosa Design and Construction Standards (City Standards)
4. City of Santa Rosa Construction Specifications for Public improvements (City Specifications)
5. State of California Department of Transportation Standard Specifications 2010 (Standard Specifications), and
6. State of California Department of Transportation Standard Plans 2010 (Standard Plans).

In the event of a conflict in any of these documents, the order of precedence shall be determined by Section 5-1.02 of these Special Provisions.

Whenever the Standard Specifications use the terms State of California, Department of Transportation, Director, Engineer, or Laboratory, the following terms shall be substituted therefor, and any reference to any of the foregoing terms shall be understood and interpreted to mean and refer to such substituted terms as follows:

For State of California - the City of Santa Rosa;

For Department - the City of Santa Rosa Department of Transportation and Public Works or the City of Santa Rosa Water Department;

For Director - the City Engineer of the City of Santa Rosa;

For Engineer - the City Engineer of the City of Santa Rosa or the City Engineer's authorized agents;

For Laboratory – Materials Engineering of the City of Santa Rosa Transportation and Public Works Department, or such other laboratory as may be authorized by the City.

Unless otherwise provided, whenever in these Special Provisions attention is directed to specific provisions in the Standard Specifications, such direction shall not be interpreted as excluding other applicable provisions of the Standard Specifications.

Unless otherwise provided, when sections and subsections of the Standard Specifications are used in these Special Provisions, such use is not exclusive and shall not be interpreted as excluding other applicable provisions of said sections and subsections but is only intended to add to or modify such sections or subsections.

Unless otherwise provided, full compensation for compliance with these Special Provisions is included in the contract price and no additional allowance will be made to Contractor therefor.

The Standard Specifications are hereby modified to delete any reference or incorporation of provisions providing for or requiring arbitration of any and all claims and disputes arising under this contract.

2 BIDDING

2-1.06 Bid Documents: Prospective bidders will be furnished with an Invitation for Bids which will state the location and description of the contemplated public works project and will show the approximate estimate of the various quantities and kinds of work to be performed and materials to be furnished with a schedule of items for which unit prices are requested.

2-1.07 Approximate Estimate: The quantities given in the Contract Documents are approximate only, being given as a basis for the comparison of bids, and the City does not, expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or part of the work or to omit parts of the work, as may be deemed necessary or advisable by the Engineer.

2-1.31 Examination of Project Plans, Specifications, City Standards, Invitation for Bids and Work Site: Prior to submitting a bid, the bidder shall carefully examine the Project Plans, Invitation for Bids, City Standards and the proposed work site. If any person contemplating submitting a bid for this public works project is in doubt as to the meaning of any part of the Contract Documents, or finds discrepancies in or omissions from the Contract Documents, he or she may submit a written request for interpretation or correction to the Engineer. The written request must be received by the Engineer a minimum of **96** hours prior to bid opening. Any interpretation or correction of the Contract Documents prior to bid opening will be made only by written addendum issued by the City. A copy of such addendum will be mailed or faxed to each Planholder. The City will not be bound by any other explanations or interpretations of the Contract Documents.

2-1.33 Bid Document Completion: Any references to Opt Out of Payment Adjustments for Price Index Fluctuations in the Standard Specifications are deleted in their entirety.

2-1.33A Bid Forms: All bids shall be made on bid forms obtained from PlanetBids at www.srcity.org/bids. The bidder shall submit its bid on the original bid forms furnished by the City. Bids submitted on forms other than the forms furnished to the bidder by the City will not be considered.

The bid forms to be submitted at the time of and with the bid are:

1. Unit Price Schedule
2. List of Subcontractors
3. List of Previous Similar Jobs
4. Noncollusion Declaration
5. Bid Guaranty Information and Bidder's Information and Signature
6. Bid Guaranty (Bid Bond or alternate security)

All bids shall give the proposed prices and must bear the original signature of the bidder. Bidders shall fill in all blanks on the bid forms where required. A bid will not be accepted unless the bidder registers as a vendor through PlanetBids at www.srcity.org/bids, downloads documents/attachments, and is added to the prospective bidders list for this project. If there is an addendum, bidders must log into PlanetBids and acknowledge the addendum to be eligible for bidding.

2-1.33B Registration with DIR: No contractor or subcontractor may be listed on a bid for this public works project unless registered with the Department of Industrial Relations (DIR) pursuant to Labor Code section 1725.5. No contractor or subcontractor may be awarded a contract for this public works project unless registered with the DIR pursuant to Labor Code section 1725.5. This public works project is subject to compliance monitoring and enforcement by the DIR.

2-1.33C Subcontractors: The Subletting and Subcontracting Fair Practices Act, Public Contract Code sections 4100-4113, inclusive (the "Act") shall apply to all subcontracts in excess of one-half of one percent of the total amount of a bid. The Act requires subcontractors, if used for such work, to be listed in the contractor's bid and prohibits the substitution of subcontractors, except as authorized by the Act. Each bidder shall, with respect to the work of any subcontractor in excess of one-half of one percent of the total amount of the bid, include as part of the bid on the bid form provided:

1. The name, business address and DIR registration number of each subcontractor who will perform work or labor or render services to the Contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the Contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the Project Plans or other Contract Documents in an amount in excess of one-half of one percent of the Contractor's total bid; and

2. The portion of the work that will be done by each subcontractor. Only one subcontractor shall be listed for each portion.

The purchase of sand, gravel, crushed rock, batched concrete, aggregate, ready-mixed concrete, and/or any other materials produced and furnished by established and recognized commercial plants, together with the delivery of such materials to the work site by the source of the materials or by recognized commercial hauling companies, is not considered as subcontracting under this section.

2-1.33E Rejection of Bids Containing Alterations, Erasures or Irregularities: Bids may be rejected if they show any alterations of forms, additions not called for, conditional bids, incomplete bids, erasures or irregularities of any kind.

2-1.34 Bid Guaranty: All bids shall be presented under sealed cover and shall be accompanied by cash, cashier's or certified check, or by a bidder's bond made payable to the City of Santa Rosa and executed as surety by a corporate surety authorized and admitted to transact a surety business in the State of California in an amount equal to ten percent of the amount of the bid. No bid shall be considered unless such cash, cashiers or certified check, or bidder's bond is enclosed with the bid. Any bidder's bond shall contain provisions for forfeiture consistent with California Public Contract Code section 20172.

2-1.40 Withdrawal of Bid: A bid may be withdrawn prior to, but not after, the hour fixed in the public notice for the opening of bids, provided that a written request to withdraw the bid, executed by the bidder or the bidder's authorized representative, is filed with the Engineer before this deadline. The withdrawal of a bid shall not prejudice the right of a bidder to submit a new bid.

2-1.43 Public Opening of Bids: Bids will be opened and read publicly at the time and place indicated in the Notice to Bidders. Bidders or their authorized agents are invited to be present.

2-1.46 Disqualification of Bidders: Serial bids from the same bidder will not be accepted. This section shall not be interpreted to mean that the same contractor may not be the contractor in one bid and listed as a subcontractor in another bid, provided that no collusion exists.

2-1.48 Competency of Bidders: No bid will be accepted from or contract awarded to a contractor that is not licensed in accordance with the law, that does not hold a license qualifying it to perform work under this contract, to whom a bid form has not been issued by the Engineer, or that has not successfully completed projects of similar character, scope and cost to the proposed project. Bidders will be required to provide a list of previous similar jobs with their bids.

3 CONTRACT AWARD AND EXECUTION

3-1.04 Contract Award: The City reserves the right to reject any or all bids. Bids are required for the entire work described herein. All bids will be compared with the Engineer's estimate of the quantities of work to be completed. Contract award, if any, will be made to the lowest responsible bidder within sixty days from the date bids are opened.

3-1.05 Contract Bonds:

Within ten days after receipt of the Notice of Award, the successful bidder shall provide the following bonds to the City:

a. Performance Bond: A performance bond to guarantee the faithful performance of the terms and conditions of the Contract by Contractor, which shall be executed in a sum of not less than one-half of the Contract price;

b. Labor and Materials Bond: A labor and materials bond (payment bond) in accordance with Part 6 of Division 4, sections 8000 *et seq*. of the California Civil Code, to guarantee against any and all claims of subcontractors or other third parties furnishing labor, materials, or supplies for the Contract, which shall be executed in a sum of 100% of the Contract price; and

c. Material Guaranty Bond: A material guaranty bond (warranty bond) to serve as surety for the guarantee requirements outlined in Section 6-3.01B, which shall be executed in a sum of not less than one-half of the Contract price.

The bond(s) shall be provided in a form acceptable to the City and issued by a corporate surety in good financial standing and authorized and admitted to transact a surety business in the state of California for the purposes and in the amount(s) stated above.

Whenever the financial or legal status of any surety on any such bond(s) is/are unacceptable to the City, it may make a demand to Contractor for further bond(s) or additional surety, not exceeding the sums originally required. Thereafter, no payment shall be made upon the Contract to Contractor or any assignees of Contractor until such bond(s) or additional surety has/have been provided to the City.

3-1.07 Indemnification and Insurance: Indemnification: Contractor shall defend, hold harmless and indemnify City, its officers, agents and employees, and each and every one of them, from and against any and all actions, damages, costs, liabilities, claims, demands, losses, judgments, penalties, costs and expenses of every type and description, including, but not limited to, any fees and/or costs reasonably incurred by City's staff attorneys or outside attorneys and any fees and expenses incurred in enforcing this provision (hereafter collectively referred to as "Liabilities"), including but not limited to Liabilities arising from personal injury or death; damage to personal, real or intellectual property or the environment; contractual or other economic damages, or regulatory penalties, arising out of or in any way connected with the performance of or the failure to perform the Contract by Contractor, any subcontractor or agent, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, whether or not such Liabilities are caused in part by a party indemnified hereunder, or such Liabilities are litigated, settled or reduced to judgment; provided, that the foregoing indemnity does not apply to liability for any damage or expense for death or bodily injury to persons or damage to property to the extent arising from (i) the sole negligence, or willful misconduct of, or defects in design furnished by City, its agents, servants, or independent contractors who are directly responsible to City (excluding Contractor), or (ii) the active negligence of City.

The existence of any of the insurance policies or coverages described in this Contract shall not affect or limit any of City's rights hereunder, nor shall the limits of such insurance limit Contractor's liability to the City hereunder. The provisions of this section shall survive any expiration or termination of the Contract.

Insurance: Contractor shall maintain in full force and effect all of the insurance coverage described in and in accordance with the insurance requirements set forth below. Maintenance of such insurance coverage during the entire performance of the Contract is a material element of the Contract. Failure by Contractor to (i) maintain or renew coverage, (ii) provide notice of any changes, modifications, or reductions in coverage, or (iii) provide evidence of renewal, if necessary, may be deemed a material breach of the Contract by Contractor, whereas the City shall be entitled to all rights and remedies at law or in equity. Notwithstanding the foregoing, any failure by Contractor to maintain required insurance coverage shall not excuse or alleviate Contractor from any of its other duties or obligations under the Contract. In the event Contractor retains or utilizes any subcontractors or sub-consultants in performance of the work, Contractor shall assure that any such subcontractor has first obtained, and shall maintain, all of the insurance coverage requirements herein set forth below.

Insurance Requirements:

A. Insurance Policies: Contractor shall maintain and keep in full force and effect, the following policies of insurance with minimum coverage as indicated below and issued by insurers with an AM Best rating of no less than A-:VI or a rating otherwise acceptable to the City.

	Insurance	Minimum Coverage Limits	Additional Coverage Requirements
1.	Commercial general liability	$5 million per occurrence $5 million aggregate	Coverage must be at least as broad as ISO CG 00 01 and must include products liability and completed operations coverage which shall continue for a period of three years after acceptance of the work by the City. If insurance applies separately to a project/location, aggregate may be equal to per occurrence amount. Coverage may be met by a combination of primary and umbrella or excess insurance, but umbrella and excess shall provide coverage at least as broad as specified for underlying coverage. Completed Operations Coverage can be provided in the form of an endorsement to Contractor's insurance (at least as broad as ISO Form CG 20 37 04 13. See endorsements below for other Additional Insured Requirements. Coverage shall not exclude subsidence.
2.	Business auto coverage	$3 million	Coverage at least as broad as ISO Form Number CA 00 01 covering any auto (Code 1). Insurance shall cover owned, non-owned and hired autos.

3.	Workers' compensation and Employer's Liability	$1 million	As required by the State of California, with Statutory Limits and Employer's Liability Insurance with limit of no less than $1 million per accident for bodily injury or disease. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the City for all work performed by Contractor, its employees, agents and subcontractors.

B. Endorsements:

1. All policies shall provide or be endorsed to provide that coverage shall not be canceled by either party, except after prior written notice has been provided to the City in accordance with the policy provisions.
2. Liability policies shall provide or be endorsed to provide the following:
   a. For any claims related to this Contract, Contractor's insurance coverage shall be primary, and any insurance or self-insurance maintained by City shall be in excess of Contractor's insurance and shall not contribute with it. Endorsements at least as broad as 20 01 04 13 or evidence of policy language will be required in non-ISO CGL policies.
   b. **The City of Santa Rosa, its officers, agents and employees are to be covered as additional insureds on the CGL policy**. Additional Insured Endorsements at least as broad as 20 10 04 13 or 20 38 04 13 are required.

C. Verification of Coverage and Certificates of Insurance: Contractor shall furnish City with original certificates and endorsements effecting coverage required above. Certificates and endorsements shall make reference to policy numbers. All certificates and endorsements are to be received and approved by the City before work commences and must be in effect for the duration of the Contract. The City reserves the right to require complete copies of all required policies and endorsements during the duration of the Contract and for a period of three years following City's acceptance of the work.

D. Other Insurance Provisions:

1. No policy required by this Contract shall prohibit Contractor from waiving any right of recovery prior to loss. Contractor hereby waives such right with regard to the indemnitees.
2. All insurance coverage amounts provided by Contractor and available or applicable to this Contract are intended to apply to the full extent of the policies. Nothing contained in this Contract limits the application of such insurance coverage. Coverage for an additional insured shall NOT be limited to the insured's vicarious liability. Defense costs must be paid in addition to coverage amounts.
3. Self-insured retentions above $10,000 must be approved by the City. At the City's option, Contractor may be required to provide financial guarantees.
4. City reserves the right to modify these insurance requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other special circumstances.

3-1.18 Contract Execution: The fully executed Contract, original bonds and insurance certificates and endorsements required under the Contract shall be delivered to the City within ten calendar days of Contractor's receipt of the Notice of Award.

The Engineer will supply Contractor with up to ten sets of the Invitation for Bids and Project Plans. At least one complete set of the Invitation for Bids and Project Plans shall be kept at the construction

site in good condition and made available to the Engineer at all times. Additional copies of the Invitation for Bids and Project Plans will be provided by the Engineer at Contractor's cost.

3-1.20 Failure to Execute Contract: Contractor's failure to deliver to the City the fully executed Contract within ten calendar days of Contractor's receipt of the Notice of Award shall be cause for the cancellation of the award and the forfeiture of the bid guaranty to the City. If the successful bidder refuses or fails to execute the Contract, the City may award the Contract to the second lowest responsible bidder. If the second lowest responsible bidder refuses or fails to execute the Contract, the City may award the Contract to the third lowest responsible bidder. The refusal or failure by the second or third lowest responsible bidder to deliver to the City the fully executed Contract within ten calendar days of receipt of the Notice of Award to the respective bidder shall likewise be cause for the cancellation of the award and the forfeiture of the bid guaranty of the respective bidder. In its discretion, the City may then re-advertise the project or construct it by day labor.

3-1.21 Return of Bid Guarantees: Within ten days after the opening of bids, the City will return the bid guarantees to all bidders except the three lowest responsible bidders. The bid guarantees of the three lowest responsible bidders will be retained until the Contract has been fully executed. In the event all bids are rejected, all bid guarantees will be returned to the respective bidders.

3-1.22 Subcontractors: The successful bidder shall furnish a list of all subcontractors as required under Sections 2-1.33C. The list shall include the name, business address, DIR registration number and the state contractor's license number of each subcontractor on the list and the names of the responsible managing employees whose names appear on the subcontractors' licenses.

4 SCOPE OF WORK

4-1.05 Changes and Extra Work: All changes to the Contract shall be made by written change order only.

All extra work shall be recorded by Contractor on a daily report signed by both the City and Contractor. The "daily reports" shall thereafter be considered the true record of extra work performed. A copy of the daily reports will be furnished to Contractor. Contractor is directed to Section 9-1.04 of this Invitation for Bids.

4-1.05C Compensation for Altered Quantities: Payment and compensation for altered quantities shall conform to the provisions of Section 9-1.06 of the Standard Specifications, except as modified herein.

5 CONTROL OF WORK

5-1.02 Contractor's Copies of Contract Documents: In the event of a conflict in any of the Contract Documents, the order of precedence from highest to lowest shall be as follows:

1. Special Provisions
2. Project Plans, consisting of 27 sheets entitled Geysers - Delta Connection Improvements, 2018-0048
3. City Standards
4. City Specifications
5. Standard Specifications
6. Standard Plans

6-1.05 Order of Work: The work as shown on the Project Plans and as specified in the Invitation for Bids shall be constructed in a sequence that is satisfactory to and approved by the Engineer.

Contractor shall prepare a work schedule per Section 8-1.02 of the Standard Specifications.

With the exception of trenching, all existing street, street light base, curb and gutter, storm drain, water line, and sewer line work shall be completed before any existing street paving is removed.

Full compensation for the conformance to the requirements of this section is included in the Contract price and no additional allowance will be made to Contractor for this work.

5-1.17 Character of Workers: Contractor is directed to Section 5-1.17 of the Standard Specifications which states:

> "If any subcontractor or person employed by the Contractor shall appear to the Engineer to be incompetent or to act in a disorderly or improper manner, he shall be discharged immediately on the request of the Engineer, and such person shall not again be employed on the work."

No additional compensation shall be granted to Contractor in the event City exercises any part of its rights under this section and any and all costs related to such exercise shall be borne by Contractor.

5-1.20 Cooperation with Other Entities: Attention is directed to Section 5-1.20 of the Standard Specifications.

Other construction including but not limited to utility, power, and pipe line relocation, may be in progress by other forces within and adjacent to the project area at the same time work is being performed under this Contract by Contractor.

Contractor shall cooperate with the forces performing other work, to the end that such forces may conduct their operations with as little inconvenience and delay as possible. Contractor shall grant such forces access to the project area as is reasonable and necessary to transport materials and equipment to the site of operations by the other forces.

5-1.20B(4)(a) Offsite Staging Areas and Construction Yards: Attention is directed to Santa Rosa City Code section 20-52.040, Temporary Use Permit.

A Temporary Use Permit shall be obtained for any offsite construction yard on private property to be used for any of the following:

a. Stockpiling of equipment and/or materials;
b. Staging of construction;
c. Placement of work trailers or mobile offices;
d. Storage of trench spoils; or
e. Other construction related activities not specifically enumerated above.

5-1.26 Lines and Grades: Contractor shall carefully preserve all bench marks, grade stakes, and all other survey markers. In the case of willful or careless destruction, Contractor shall bear the cost of replacing the markers.

Contractor shall contact the Engineer directly for coordination of survey staking. Written staking requests must be submitted at least two working days in advance of the date and time stakes are needed.

5-1.27B Examination and Audit: Pursuant to California Government Code section 8546.7, any contract with the City involving expenditures in excess of $10,000 shall be subject to the examination and audit of the California State Auditor for a period of three years after final payment is made to Contractor by City under this Contract. Any such examination and audit will be confined to those matters connected with the performance of this Contract.

5-1.30A Inspection: Contractor shall bear all costs associated with the re-inspection of any defective, rejected or unauthorized work as determined by the Engineer in Engineer's sole discretion. Such costs of re-inspection, including any costs incurred by the City for additional staff time or fees for third-party consultant inspectors, will be deducted from one or more progress payments hereunder.

5-1.36A Property and Facility Preservation: Attention is directed to Section 5-1.36 of the Standard Specifications.

At Contractor's sole expense, all fences, gates, landscaping, drainage ditches, sidewalks, irrigation systems, and any other improvements that are damaged, removed or destroyed because of Contractor's operations, shall be replaced in accordance with City Standards at a minimum and restored to the same or better condition. Concrete surface treatment and score marks shall match adjacent existing concrete improvements.

5-1.36E Obstructions: Attention is directed to Section 5-1.36 of the Standard Specifications and to the possible existence of underground gas mains, high voltage lines, telephone ducts, storm drains and water and sewers systems, the locations of which are not shown on the Project Plans. The determination of the location of these facilities and the cost of repair or replacement in the event of damage to such facilities are the sole responsibility of Contractor.

Should Contractor alter any public utility or private improvements to facilitate its operations or for its sole benefit, which alteration would not be otherwise required, Contractor shall make whatever arrangements are necessary with the owner or controlling authorities and shall bear all expenses in connection therewith. Any damages to any public utility or private improvement caused by Contractor shall be repaired by Contractor at its sole expense and to the full satisfaction of the Engineer or the controlling authority.

Any subsurface information and data furnished under any part of this Contract are not intended as a representation or warranty but are furnished for information only. It is expressly understood that the City will not be responsible for the accuracy thereof or for any deduction, interpretation or conclusion

drawn therefrom by Contractor. The information is made available so that Contractor may have ready access to the same information available to the City and is not part of this Contract.

PRIOR TO STARTING ANY EXCAVATION, CONTRACTOR SHALL (AT LEAST TWO WORKING DAYS IN ADVANCE) CALL UNDERGROUND SERVICE ALERT (USA) toll free at (800) 227-2600 and provide USA with all necessary data relative to the proposed excavation. USA will accept calls and process information to participating agencies who have underground facilities in the area between the hours of 7:30 a.m. and 5:00 p.m. daily, except Saturdays, Sundays, and holidays. Between the hours of 5:00 p.m. and 7:30 a.m., calls will be recorded and then processed after 7:30 a.m. For emergency situations, after hours, and on Saturdays, Sundays and holidays, Contractor shall contact the owner of the affected facility.

Contractor shall coordinate all work with the appropriate City field personnel. When City work forces are required at the job site to perform Contract items of work, Contractor shall give a minimum of two working days advanced notification to the appropriate field office:

Water Division:	(707) 543-4200
Sewer Division:	(707) 543-4200
Street Division:	(707) 543-3880
Survey Division:	(707) 543-3834

5-1.43 Potential Claims and Dispute Resolution: "Claim" means a separate demand by Contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following: (A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by the City under the Contract; (B) Payment by the City of money or damages arising from work done by, or on behalf of, Contractor pursuant to the Contract and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled; or (C) Payment of an amount that is disputed by the City.

Upon receipt of a Claim, the City shall conduct a reasonable review of the Claim and, within a period not to exceed 45 days, shall provide Contractor a written statement identifying what portion of the Claim is disputed and what portion is undisputed, provided, the parties may extend the 45 day time period by mutual agreement.

If the City needs approval from the City Council to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the Claim, and the Council does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a Claim, the City shall have up to three days following the next duly publicly noticed meeting of the City Council after the 45-day period, or extension expires to provide Contractor a written statement identifying the disputed portion and the undisputed portion.

Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the City issues its written statement. If the City fails to issue a written statement, the Claim shall be deemed rejected in its entirety.

If a Contractor disputes the City's written response, or if the City fails to respond to a Claim within the time prescribed, the Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the City shall conduct a meet and confer conference within 30 days for settlement of the dispute. Within 10 business days following the conclusion of the meet and confer conference, if the Claim or any portion of the Claim remains in dispute, the City shall provide the Contractor a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the City issues its written statement. Any disputed portion of the Claim, as identified by Contractor in writing, shall be submitted to nonbinding mediation, with

the City and the Contractor sharing the associated costs equally. The City and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the Claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the Claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator.

6 CONTROL OF MATERIALS

6-2.01 Source of Supply and Quality of Materials: All materials required to complete the work under the Contract shall be furnished by Contractor and shall be free of hazardous substances.

6-3.01 General: Statistical means will not be used by the City for determination of Standard Specification compliance. Whenever both operating range test results and Contract compliance requirements are specified in these special provisions, the operating range requirements shall apply to the individual test results.

6-3.01A Material Submittals: Upon award of the Contract by City, Contractor shall submit to the Engineer a list of all materials proposed to be used on this project and any supporting documentation and/or samples required and source of supply.

For material listed on the "Engineer's List of Approved Items" which is located in the Sewer and Water sections only of the City Standards, the Engineer shall be provided with the name of the manufacturer and model/part number for all material proposed for this project, unless that item has been replaced as shown on the Project Plans or in the Invitation for Bids.

For all other materials used on this project, regardless of the type of work, Contractor shall provide to the Engineer the name of the manufacturer and model/part number along with supporting documentation and/or samples that will allow the Engineer to determine the material's acceptability.

The Engineer reserves the right to reject any proposed material, whether on the City's "Engineer's List of Approved Items" or not. If the City obtains information indicating that a listed item is not performing satisfactorily or is found to be defective, that item will be rejected, and Contractor shall submit a replacement for review at no additional cost to the City.

6-3.01B Material Guarantee: Before any contract is awarded, the bidder may be required to furnish samples of materials and detailed descriptions of equipment to be used in the construction of the project. The materials samples may be subjected to the tests provided for in the Standard Specifications or in this Invitation for Bids to determine their quality and fitness for the project. The successful bidder shall unconditionally guarantee project materials and workmanship for a period of one year from the date of recording of the Notice of Completion. The guarantee shall cover 100% of all costs of repairs within the one year period, including all costs of labor, materials, equipment, and incidentals. Except as may be otherwise provided in Section 3-1.05, the successful bidder shall provide a surety bond executed by a corporate surety authorized and admitted to transact a surety business in the state of California in the minimum amount of one-half of the Contract price to cover this guarantee.

6-3.05 Quality Assurance: California Test 216 (Relative Compaction) testing will be modified as follows: A mechanical compactor (Ploog Engineering Co. Model M 100 or equivalent) with 10-pound hammer and split compaction molds shall be used in lieu of the specified manual compaction equipment.

California Test 231 (Nuclear Gage Determination of In-Place Density) will be modified as follows: In-place density and relative compaction may be determined on the basis of individual test sites in lieu of the area concept, at the discretion of the Engineer.

6-4 Water Utility

6-4.01A Construction Water: All water required for the performance of the work shall be provided by Contractor. Prior to obtaining water from the City's water system, Contractor shall obtain a Water

Use Permit from the City of Santa Rosa Water Department and rent a hydrant or bridge meter. Contractor is responsible for the cost of all water and the cost of all deposits, permits and fees.

Contractor is prohibited from operating gate valves or fire hydrants on the City system.

The acquisition of water from the City's water system through un-metered hydrants or other facilities is a violation of City ordinance and State law. The use of water from sources other than the City's water system must be approved by the Engineer in advance of the use.

Citations and fines will be levied for violation of these and other utility regulations and deductions will be made from payments consistent with Section 7-1.02A(1) of the Standard Specifications.

6-4.01B Water Utility Notification: Contractors or parties requiring work of any kind by the City of Santa Rosa Water Department forces shall request such services a minimum of 48 hours in advance of the time such services are desired. Work requests which will involve the City of Santa Rosa Water Department forces for more than eight hours or an extensive number of City parts shall be requested a minimum of seven calendar days in advance.

If it is necessary to terminate or disrupt utility service to any customer, Contractor shall make the request for such work by City forces an additional 72 hours (three additional working days for a total of five working days advance notice) in advance of the time such services are desired to allow affected customers a minimum of 72 hours' notice. Contractors who fail to keep field appointments will be billed for scheduled City of Santa Rosa Water Department crew standby time which was used, and the Contractor shall bear the costs incurred by the City of Santa Rosa's Water Department for re-notification of customers.

City of Santa Rosa Water Department crews work a 9/80 schedule. This schedule may prohibit shutdowns for tie-ins on alternating Fridays. After hours work or weekend work may be performed if prior authorization from the Engineer is obtained.

Other than the hours specified in this Invitation for Bids, requests by Contractor for after hours or weekend work is to be avoided whenever possible. Any overtime costs incurred by City for such work shall be borne by Contractor.

Interruption of utilities service to commercial customers shall be coordinated with the customer to minimize disruption to the enterprise to the greatest extent practicable. After notification by the Contractor of the need, the City of Santa Rosa Water Department will contact all commercial customers and inform Contractor accordingly.

6-4.01C Water Facility Damage: All damage caused to the City's water system shall be immediately reported to the Engineer.

Damage caused to the City's water system by Contractor's operations shall be repaired by the Contractor at Contractor's sole expense in a manner satisfactory to the City of Santa Rosa Water Department. Such repairs shall not be charged to the City or any City project. All repair work shall be witnessed and approved by the City of Santa Rosa Water Department prior to backfilling the excavation. The City will require re-excavation if backfilling occurs prior to inspection, which costs shall be borne by Contractor.

Contractor is responsible for, at its sole cost and expense, the repair and remediation of damage to property and facilities caused by any of the following circumstances:

a. Contractor fails to make a written request for a markout or begins excavation without providing the City of Santa Rosa Water Department a reasonable opportunity to mark facilities;
b. Contractor destroys markouts;
c. Contractor fails to perform hand digging or probing for utilities near markouts; or
d. Contractor fails to use reasonable caution, regardless of whether markouts are present or clear. Reasonable caution includes any efforts to avoid damaging existing facilities, such as when excavating in the vicinity of water mains.

City may, in its discretion, opt to make the repairs for which Contractor is responsible with its own forces. In such cases, the repairs will be made at Contractor's expense in accordance with the emergency repair rate schedule of the City of Santa Rosa Water Department. The City may make repairs whenever restoration of service requires extraordinary speed or special equipment. Contractor will be billed accordingly, and City shall have the right and option to withhold payment hereunder, or a portion thereof, for any such costs billed but not promptly paid by Contractor.

6-4.02 Salvage: All valves, hydrants, and other appurtenances of the water system that are the property of City and removed by Contractor shall be delivered to the City's Municipal Services Center (55 Stony Point Road) unless Contractor has obtained specific written approval from the City of Santa Rosa Water Department to otherwise dispose of the materials.

6-4.03 Trade Names and Alternatives: Unless otherwise specified, material and equipment specifications that identify a particular patent, trade name or manufacturer, may be satisfied through substitute materials and equipment accepted by the City. Contractor may offer substitute materials and equipment of equal or better quality to the City. Any such offer shall be made in writing to the Engineer at least four weeks in advance of the time Contractor wishes to order the materials or equipment. Contractor shall include sufficient data which, together with any other information the Engineer may require, will enable the Engineer to determine the acceptability of the materials and equipment. When the substitute materials or equipment necessitate changes to any part of the work, the information shall include drawings and details showing all such changes and Contractor shall perform these changes as a part of any acceptance of substitute materials or equipment. The use of substituted materials and equipment will be permitted only after written acceptance of the materials and equipment by the Engineer. Such acceptance shall not relieve the Contractor from full responsibility for the sufficiency, quality and performance of the substitute materials and equipment.

The City will not, under any circumstances, acknowledge or consider any offers to accept substitute materials or equipment between the dates of public notice of advertisement and the bid opening.

7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

7-1.02A(1) Forfeitures for Health and Safety Violations: Contractor shall comply with all applicable provisions of the Santa Rosa City Code and any failure to do so shall constitute a breach of the Contract. In the event of any violation of the Santa Rosa City Code that may impact public health and safety, including, but not limited to Chapter 17-12, "Storm Water" and Chapter 13-04, "Street Encroachments," City shall have the right to impose a charge against Contractor in an amount equal to $500.00 per violation per day. Prior to the imposition of any charge hereunder, City shall first provide a written notice to Contractor of the violation and setting forth a reasonable period of time for Contractor to cure the violation(s). In the event Contractor fails to cure any such violation within the time provided, City shall have the right, in addition to all other rights and remedies available to City, to deduct and withhold as a permanent forfeiture by Contractor the appropriate amounts from any payment otherwise due Contractor under this Contract.

7-1.02K(2) Wages: Pursuant to Labor Code sections 1770 *et seq*., each laborer or mechanic of Contractor or any subcontractor engaged in work on the project under this contract shall be paid not less than the hourly wage rate of per diem wages set forth in the prevailing wage rate schedule published by the Director of Industrial Relations, regardless of any contractual relationship which may be alleged to exist between Contractor or any subcontractor and such laborers and mechanics. A copy of the schedule of prevailing wage rates can be obtained online at www.dir.ca.gov or from the Department of Transportation and Public Works at 69 Stony Circle, Santa Rosa.

Any laborer or mechanic employed to perform work on the public works project under this Contract, which work is not covered by any of the foregoing classifications, shall be paid not less than the prevailing wage rate of per diem wages specified herein for the classification which most nearly corresponds to the work to be performed by the worker.

The foregoing specified prevailing wage rates are minimum rates only, and Contractor may pay any wage rate in excess of the applicable rate.

Pursuant to Labor Code Section 1775, Contractor as a penalty to the owner shall forfeit not more than $200.00 for each calendar day, or a portion thereof, for each worker paid less than the prevailing wage rate established by the Department of Industrial Relations for such work or craft in which such worker is employed. The difference between such prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which the worker was paid less than the prevailing wage rate shall be paid to each worker by Contractor.

Contractor shall only provide prevailing wage reports upon written request from City. When requested, these prevailing wage reports must be redacted by the Contractor prior to providing them to City.

7-1.02K(4) Apprentices: Contractor agrees to comply with Chapter 1, Part 7, Division 2, sections 1777.5 *et seq*. of the California Labor Code. These sections require contractors and subcontractors to employ apprentices in apprenticeable occupations in a ratio of not less than one hour of apprentice work for each five hours of journeyman work (unless an exception is granted in accordance with Section 1777.5), and the contractors and subcontractors shall not discriminate among otherwise qualified employees as apprentices solely on the ground of sex, race, religion, creed, national origin, ancestry, or color. Only apprentices as defined in Labor Code section 3077, who are in training under apprenticeship standards and who have written apprentice agreements will be employed on public works in apprenticeable occupations. The responsibility for compliance with these provisions is fixed with the prime contractor for all apprenticeable occupations.

7-1.02K(6)(a)(1) Notice to Vendors: Attention is directed to the current OSHA Standards. All equipment, tools and materials which are furnished and/or installed as part of this Contract shall meet or exceed the aforementioned standards in order to be considered acceptable.

7-1.02K(6)(b) Excavation Safety: When the digging or excavation occurs during project construction, Contractor shall:

a. Promptly notify City in writing of the following conditions before any such conditions are disturbed:

    1. Material that the Contractor believes may be hazardous waste as defined in Health and Safety Code section 25117 that is required to be removed to a Class I, Class II or Class III disposal site in accordance with provisions of existing law;
    2. Subsurface or latent physical conditions at the site differing from those indicated in the Invitation for Bids; and
    3. Physical conditions at the site of any unusual nature, materially different from those ordinarily encountered and generally recognized as inherent in the type of work under the Contract.

b. The City will investigate the conditions and will issue a change order under the terms of the Contract if it finds that the conditions warrant it.

c. If a dispute arises between City and Contractor as to whether a change order is warranted, Contractor shall not be excused from any scheduled completion date provided for in the Contract but shall proceed with all work to be performed under the Contract.

7-1.02K(6)(b)(1) Trench Excavation Safety Plans: When the estimated cost for the excavation of any trench or trenches five feet or more in depth will exceed $25,000.00, Contractor shall submit to the Engineer in advance of excavation a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards established by the construction safety orders, or if the trench is anticipated to be greater than 20 feet, the plan shall be prepared by a registered civil or structural engineer.

A permit to do the above described work shall be obtained from the State of California, Division of Industrial Safety. Proof of such permit shall be submitted to the Engineer prior to starting the trench work.

Full compensation for complying with the provisions of this section shall be considered as included in the Contract price and no additional allowance will be made for the work.

7-1.02K(6)(d) Confined Space Safety: Any confined space entry for this project, including but not limited to manhole or water storage tank entry, will require a confined space entry permit pursuant to Cal/OSHA regulations as set forth in title 8 California Code of Regulations (CCR) sections 5157 or 5158. Confined space entry shall have the meaning ascribed in title 8 CCR sections 5157 and 5158. For any confined space entry for construction operations regulated by title 8 CCR section 1502, Contractor shall comply with title 8 CCR section 5158, “Other Confined Space Operations.” For any other confined space operations, Contractor shall comply with title 8 CCR section 5157, “Permit-Required Confined Spaces.”

Attention is directed to the technical specifications in the Special Provisions for information regarding entry to any City maintained confined space. Pursuant to title 8 CCR section 5157, Contractor is required to obtain any available information regarding hazards and operations for any City maintained confined spaces. The City maintained Confined Space Entry Manual is available

for viewing at the City of Santa Rosa Water Department or Transportation and Public Works Department office at 69 Stony Circle, Santa Rosa.

Contractor shall immediately inform the Engineer of any previously unidentified hazards confronted or created during confined space entry.

7-1.02L(2)(a) Patents and Royalties: All fees, royalties, or claims for any patented invention, article, process or method that may be used upon or in any manner connected with the work under this Contract shall be paid by Contractor. Contractor and its sureties shall protect and hold harmless City and its officers, agents, and employees from any and all demands made for such fees royalties or claims brought or made by any third party, and before the final payment is made on the account of the Contract, Contractor shall, if requested by City, furnish acceptable proof of a proper release from all such claims and liabilities.

Should Contractor, its officers, agents, or employees, or any one of them be enjoined from furnishing or using any invention, article, material, or plans supplied or required to be supplied or used under the Contract, Contractor shall promptly substitute other articles, materials, or appliances in lieu thereof of equal efficiency, quality, finish, suitability, and market value, and satisfactory in all respects to the Engineer. In the event that the Engineer elects, in lieu of such substitution, to have supplied and to retain and use any such invention, article, materials, or plans as may be required to be supplied by the Contract, Contractor shall pay such royalties and secure such valid licenses as may be requisite and necessary for City, its officers, agents, and employees, or any one of them to use such invention, article, materials, or appliance without being disturbed or in any way interfered with by any proceeding in law of equity on account thereof. Should Contractor neglect or refuse to make the substitution promptly or to pay such royalties and secure such licenses as may be necessary, then in that event the Engineer shall have the right to make such substitutions or City may pay such royalties and secure such licenses and charge Contractor even though final payment under the Contract may have been made.

7-1.02M(3) Mined Materials: California Public Contract Code section 20676 prohibits surface mining operators which are subject to the Surface Mining and Reclamation Act of 1975 (SMARA) from selling California mined construction material to the City unless the operator is identified in a list referred as the **3098 List**. The List, which is maintained by the Department of Conservation's Office of Mine Reclamation (OMR), changes throughout the year and can be viewed at the OMR website: http://www.consrv.ca.gov/OMR/ab_3098_list/index.htm. To confirm whether or not a specific operator is on the List at any given time, Contractor shall call the OMR at (916)323-9198.

7-1.03A Maintaining Traffic: Attention is directed to Sections 7-1.04 of the Standard Specifications and to the following modifications thereof.

If construction is within City owned right-of-way, provisions shall be made for the safe passage of public traffic through the work site at all times consistent with the requirements of Santa Rosa City Code Chapter 13-04.

Except for projects to be performed under a minor contract, Contractor shall install and maintain project identification signs at each end of the project or as directed by the Engineer two weeks prior to any construction activity. City shall furnish the appropriate sign panels upon request from Contractor. To mount the sign panels, Contractor shall furnish and install 4" X 4" posts or mount by other appropriate methods as approved by the Engineer. These sign panels shall be returned to the City Corporation Yard at 55 Stony Point Road after completion of the project.

Two weeks prior to any construction activity, advance notice signs for road closures shall be furnished and installed by Contractor at each end of the project and shall remain in place throughout the duration of the subject closure. Details of panel construction and lettering shall be approved by the Engineer.

Contractor shall furnish, install, and maintain at its expense all barricades, signs, lights, and other devices necessary to adequately warn of any obstructions to the traveled and pedestrian way and provide flaggers as necessary for the safety of public traffic and pedestrians and to provide access to property adjacent to the work site and Contractor shall comply with the Americans with Disabilities Act of 1990 (42 U.S.C. 12101, *et seq*.) (ADA) and any regulations and guidelines issued pursuant to the ADA.

Contractor shall comply with the current edition of the California Manual of Uniform Traffic Control Devices (CA MUTCD) for all items related to traffic within the work site.

Rain and other occurrences that may cause the suspension or delay of the work shall in no way relieve Contractor of its responsibility to provide traffic control and public access through the work site as specified herein. At all times, Contractor shall keep at the work site such materials, forces and equipment as may be necessary to keep roads, streets, and driveways within the work site open to traffic and in good repair and shall expedite the passage of such traffic, using such forces and equipment as may be necessary.

Should Contractor fail, in the opinion of the Engineer, to provide all the materials, forces and equipment necessary to maintain traffic through the work site as set forth herein, City may take steps necessary to remedy any such failure, including but not limited to causing such work to be performed and/or suspending any further work under the Contract. Any such remedial cost and expense incurred by the City, plus an administrative charge of 15%, shall be immediately due and payable by Contractor and may be deducted from any amounts owed to Contractor hereunder. In the event there are insufficient sums owed to Contractor hereunder to cover the foregoing costs and charges, City shall have the right to pursue any other remedy to recover the same, including but not limited to, proceeding against any surety or bond in favor of City. City's rights under Section 7-1.02 are intended to be in addition to and not in lieu of any charges imposed by City against Contractor under Section 7-1.02A(1) above for violations of the Santa Rosa City Code.

Contractor shall be responsible for informing emergency response agencies operating within the area of the work of obstructions to either public or private roads caused by reason of Contractor's operations hereunder.

Contractor shall make provisions for the safe passage of pedestrians around the project work site at all times.

8 PROSECUTION AND PROGRESS

8-1.01A Assignments: Once awarded, this Contract shall not be transferred, assigned, or sub-contracted, except as herein expressly provided without the prior written consent of the City in the City's sole and absolute discretion. See Section 5-1.12 of the Standard Specifications.

8-1.04B Standard Start: Contractor shall begin work within ten calendar days after the date authorized in the Notice to Proceed and shall diligently prosecute the Contract to completion before the expiration of:

180 WORKING DAYS

Delta Pond will be taken out of service and the water level lowered by City forces by **August 1, 2022** at which time the contractor may commence with the work within the interior of the Delta Pond.

8-1.05 Time: Delta Pond shall be returned to service for partial occupancy / utilization by the City beginning **October 15, 2022.**

All work within the interior of the Delta Pond shall be completed by **October 15, 2022.**

Unless otherwise directed by Engineer, Contractor shall not conduct any activities that generate noise earlier than 7:00 a.m. or later than 7:00 p.m.

Contractor may work 6 days per week upon approval from the Engineer. No work on Sundays will be allowed.

8-1.10 Liquidated Damages: Contractor hereby agrees that Contractor shall pay to the City liquidated damages for each and every calendar day delay over and above the number of working days prescribed above for finishing the work in the amount shown in Section 8-1.10 of the Standard Specifications.

9 MEASUREMENT AND PAYMENT

9-1.04 Force Account Work: All work done on a force account basis shall be recorded daily on report sheets prepared by Contractor and signed by both the Engineer and Contractor. Such reports shall thereafter be considered the true record of force account work performed during the project. Such reports shall be furnished to the Engineer and a copy retained by Contractor.

All extensions of labor, equipment, and material costs shall be completed by Contractor and submitted to the Engineer within 30 days of the completion of the extra work. Completed and extended extra work reports received later than the times herein prescribed may be deemed invalid and rejected without payment at the discretion of the Engineer.

9-1.07 Payment Adjustments For Price Index Fluctuations: Any references to Opt Out of Payment Adjustments for Price Index Fluctuations in the Standard Specifications are deleted in their entirety.

9-1.16 Progress Payments: Once each month for progress pay purposes, the City will prepare a written estimate of the total amount of completed work and accepted materials purchased by Contractor but not installed. The City shall retain five percent of such estimated value of the completed work and the unused materials and pay Contractor the balance after deducting all previous payments and all sums to be retained under the provisions of the Contract. No such estimate or payment shall be required to be made when, in the judgment of the Engineer, the work is not proceeding in accordance with the provisions of the Contract or when, in the Engineer's judgment, the total value of the completed work since the last estimate is less than $500.00. No such estimate or payment shall be construed to be an acceptance of any defective work or improper materials.

After Contract acceptance, the Engineer will prepare a written proposed final estimate of the proposed final quantities of work completed under the Contract and the value of such work and will submit such estimate to Contractor. The City shall retain five percent of such estimated value of the work done and shall pay to Contractor the balance after deducting all amounts to be retained under the provisions of the Contract.

The City may, at its option and at any time, retain out of any amounts due Contractor sums sufficient to cover any unpaid claims of City or others, provided that sworn statements of all non-City claims shall have been filed with the Director of Finance.

9-1.16E(6) Substitution of Securities for Withheld Amounts: Pursuant to Public Contract Code section 22300, securities may be substituted for any moneys withheld by City to ensure performance under this Contract, provided that substitution of securities provisions shall not be required in contracts in which there will be financing provided by the Farmer's Home Administration of the United States Department of Agriculture pursuant to the Consolidated Farm and Rural Development Act (7 USC sections 1921 *et seq*.), and where federal regulations or policies or both do not allow the substitution of securities. At the request and expense of Contractor, securities equivalent to the amount withheld shall be deposited with the City, or with a state or federally chartered bank as the escrow agent, which shall then pay such moneys to Contractor. The Director of Finance is authorized to execute substitution of securities agreements on behalf of the City. The City will return the securities to Contractor upon satisfactory completion of the Contract as determined by City in its sole discretion and the resolution of all outstanding claims against the securities. Contractor shall be the beneficial owner of any securities substituted for moneys withheld and shall receive any interest thereon.

Securities eligible for investment under this section shall include those listed in Government Code section 16430, bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit or any other security mutually agreed to by Contractor and the

City, provided that the substituted security is equal to or not less than five percent of the Contract amount.

Security substitutions must be submitted by Contractor and approved by City prior to the time of the first progress payment to be made under the Contract. No other method of substituting securities for retention will be accepted. The security substitution shall be done only upon execution of an agreement satisfactory to City which includes the following provisions:

a. The amount of securities to be deposited;
b. The terms and conditions of conversion to cash in case of the default of Contractor; and
c. The procedure for return of securities upon completion of the Contract.

9-1.17D Final Payment and Claims: The processing of payment of the final estimate shall not be commenced less than 35 days after the date of recording of the Notice of Completion with the County Recorder's Office. Contractor is advised that it takes approximately ten days for a check to be issued following a request for payment.

Contractor shall submit its written statement of all claims for additional compensation under the Contract to the Engineer within 15 days after submission to Contractor of the proposed final estimate.

If Contractor does not file a claim within the 15 day period, or upon Contractor's approval, the Engineer will issue a final written estimate and the City shall pay to Contractor the entire sum due after deducting all previous payments, if any, and all amounts to be retained under the provisions of the Contract.

If Contractor files a claim within the 15 day period, the Engineer will furnish a semi-final estimate and pay the amount due under the semi-final estimate within 30 days. The semi-final estimate is conclusive as to the amount payable except as may be affected by claims and any amount retained. The Engineer shall then consider and investigate such claim and shall make such revision in the final quantities as the Engineer may find to be due and shall then make and issue a final written estimate. The City will pay the amount due, after deducting all previous payments, if any, and amounts to be retained under the provisions of the Contract.

Any and all prior partial estimates and payments shall be subject to correction in the final estimate and payment.

The final estimate shall be conclusive and binding against both parties to the Contract on all questions relating to the performance of the Contract and the amount of work done thereunder and compensation therefor, except in the case of gross error.

9-1.17D(3) Final Determination of Claims: Claims filed by Contractor shall be in sufficient detail to enable the Engineer to determine the basis and amount of the Claims. Contractor shall also furnish reasonable documentation to the City to support Claims. If additional information is required by the Engineer, Contractor shall provide such information to the Engineer no later than the 15th day after receipt of the written request from the Engineer. If the 15th day falls on a weekend, holiday, or day City offices are closed, then the information shall be provided to the Engineer no later than close of the next business day. Failure to submit the requested information to the Engineer within the time specified will be sufficient cause for denying the Claim.

Contractor shall keep full and complete records of the costs and additional time incurred for any work for which a claim for additional compensation is made. The Engineer or any designated Claim investigator or auditor shall have access to those records and any other records as may be reasonably required by the Engineer to determine the facts or contentions in each Claim. Failure to grant access to such records shall be sufficient cause for denying the Claims.

9-1.22 Arbitration: Any references to Arbitration in the Standard Specifications are deleted in their entirety.

Claims submitted by Contractor shall be accompanied by a notarized certificate containing the following language:

Under the penalty of law for perjury or falsification and with specific reference to the California False Claims Act, Government Code sections 12650 *et seq*., the undersigned,

_____,
(Name)

_____ of
(Title)

_____
(Contractor)

hereby certifies that the claim for additional compensation made herein is supported by a true statement of the actual costs incurred and time expended on this project and is fully documented by records maintained by Contractor.

Dated _____

/s/_____

Subscribed and sworn before me this _____ day of

_____

_____
Notary Public

My Commission Expires _____

Failure to submit the notarized certificate will be sufficient cause for denying the claim.

Any claim for overhead expenses, in addition to being certified as stated above, shall be supported by an audit report of an independent Certified Public Accountant. Any such overhead claim shall also be subject to audit by the City at its discretion.

Any costs or expenses incurred by the City in reviewing or auditing any claims that are not supported by Contractor's cost accounting or other records shall be deemed to be damages incurred by the City within the meaning of the California False Claims Act.

City of Santa Rosa

TECHNICAL SPECIFICATIONS

FOR

GEYSERS-DELTA CONNECTION PROJECT

CONTRACT NO. C02111

Brelje & Race
CONSULTING ENGINEERS

MAY 2022

SECTION 01 10 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Project Description
   2. Description of Bid Items
   3. Partial Occupancy/Utilization Requirements
   4. Contractor Use of Site
   5. List of Project Plans

1.02 RELATED SECTIONS

A. Contract General Specifications

B. Section 01 35 13 – Special Project Procedures

C. Section 01 50 00 – Temporary Facilities and Controls

1.03 PROJECT DESCRIPTION

A. The work to be performed under these specifications is located at the City of Santa Rosa's Delta Effluent Storage Pond – 727 Willowside Road, Santa Rosa, California. The Pond is located west of Santa Rosa. Access to the project is from an approximately ¾ mile long gravel and dirt road accessed from a driveway along the west side of Willowside Road. See Section 01 50 00 for additional restrictions.

B. The project is generally described as construction of a new connection between the City's existing high pressure geysers pipeline and Delta Pond. The primary elements of this work are described as follows:
   1. A pipeline to Delta Pond from an existing geysers turnout pipeline including a flow meter, valve(s), and appurtenances.
   2. A concrete discharge structure and discharge valve facilities.
   3. A concrete spillway and stilling basin.
   4. An electrical feed to the discharge facilities from the existing Delta Pond pump station building.
   5. Electrical and controls facilities for operation of the new discharge facilities.
   6. Earthwork, slope protection, and surfacing improvements.
   7. Replacement of an existing City furnished butterfly valve and torque tube assembly.

8. Replacement of an existing insertion flow meter with an electromagnet flow meter.

1.04 DESCRIPTION OF BID ITEMS

A. Bid Items are presented to indicate major categories of the work for purposes of comparative bid analyses and payment breakdown for monthly progress payments. Bid items are not intended to be exclusive descriptions of work categories and the Contractor shall determine and include in its pricing all materials, labor, and equipment necessary to complete each Bid Item (work phase) as shown and specified.

B. **Bid Item Descriptions:**

1. **Mobilize, Demobilize, and Site Preparation** shall be paid for at the contract **lump sum** fixed price which shall include all labor, materials, equipment, preparatory work, and operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site; for the establishment of facilities and construction access ramps as necessary; for the removal of topsoil, organic material, and unsuitable surface materials from the work areas and disposal of this material; construction water and all work involved in its obtainment, development and distribution; demobilization, and for all other work and operations which must be performed or costs incurred prior to beginning and required for finishing work on the various contract items in the Bid Schedule, and no additional allowance will be made therefor.

   The bid item amount for Mobilize, Demobilize, and Site Preparation shall not exceed 3% (three percent) of the total bid price. The first payment for Mobilize, Demobilize, and Site Preparation shall be no more than fifty percent (50%) of the bid item amount indicated, contingent upon site mobilization of equipment, an approved Construction Schedule, and proof of acquisition of all required bonds, insurance, and permits. The second payment for Mobilize, Demobilize, and Site Preparation shall be the remainder of the bid item amount and shall be paid after completion of all contract items of work and completion of the final punch list.

2. **Archaeological and Biological Monitoring Coordination** shall be paid for at the contract **lump sum** price, which price shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for performing all work involved in following the direction of the City's Archaeologist, Tribal representative, and the City's Biologist throughout all construction activities and as required to comply with the mitigation measures listed in the Mitigation Monitoring and Reporting Plan (MMRP) and Section 01 35 13 of these technical specifications, including but not limited to, coordination, notification of ground disturbing activities, and temporary work stoppages to evaluate and/or salvage archaeological (pre-historic or historic cultural material) discoveries and/or special status species, excavated material handling, and being directed to other portions of the project, as specified in these Contract Documents, and as directed

by the Engineer, Archaeologist, Tribal representative, and/or Biologist, and no additional allowance will be made therefor.

If suspension of construction activities for analysis and/or salvaging of resources exceed five (5) working days, the Contractor shall be entitled to an extension of time in accordance with the defined extra work procedures. See Section 01 35 13 for additional information.

If suspension of construction activities, following erection of the temporary construction fencing, to allow special status species to exit the work areas exceeds five (5) working days, the Contractor shall be entitled to an extension of time in accordance with the defined extra work procedures. See Section 01 35 13 for additional information.

3. **Temporary Construction Fencing** shall be paid for at the contract unit price per **linear foot**, which price shall include full compensation for all labor, materials, tools, equipment, and incidentals, and for performing all work involved in furnishing and placing exclusion fencing as shown on the Project Plans at all locations where work is to be performed outside the outer top of the existing Delta Pond embankment and as directed for installation by the Engineer and/or City's Biologist, and no additional allowance will be made therefor.

   The estimated quantity of Temporary Construction Fencing is for bidding purposes only. This quantity may be increased, decreased, or eliminated in its entirety based on field condition evaluation by the Engineer, and no adjustment in the contract bid price or other contract items will be made therefor.

4. **Cleanup and Erosion Control** shall be paid for at the contract **lump sum** fixed price which shall include all labor, materials, equipment and incidentals, and for performing all work involved in controlling surface water and excavation drainage; furnishing, installing, and compacting permanent erosion control measures and temporary BMP's (burlap bags, silt fences, straw waddles, hydroseed, erosion control blankets, construction entrances, etc.); preparing and complying with the requirements of a Storm Water Pollution Prevention Plan (SWPPP); removal and disposal of temporary BMP's; final clean-up, and other work incidental thereto not specifically enumerated on the Project Plans, these Special Provisions, and no additional allowance will be made therefor.

   No additional payment per rain event or for each storm water annual report submitted will be made. Failure to submit a completed storm water annual report will result in withholding 25% of the lump sum price paid for Cleanup & Erosion Control.

5. **Embankment Excavation** shall be paid for at the in-situ bank **cubic yard** unit price which shall include all labor, materials, and equipment necessary to excavate the embankment to the depths indicated on the Project Plans including, but not limited to excavating, loading, hauling, stockpiling, scraping, protecting existing utilities, and other work incidental thereto, complete to the lines and grades shown on and in accordance

with the Project Plans, these Special Provisions, and no additional allowance will be made therefor.

Embankment Excavation is a **Final Pay Item (F)** as defined in the Standard Specifications. The Contractor shall perform their own calculations based upon their methods of operation and adjust the unit price per cubic yard accordingly.

6. **Embankment & Miscellaneous Fill** shall be paid for at the contract in-place compacted **cubic yard** unit price which shall include all labor, materials, and equipment necessary to prepare and place embankment and miscellaneous fills to the lines and grades shown on the Project Plans with suitable on-site material, including but not limited to moisture conditioning, scraping, transporting, placing, grading, compacting, trimming, foundation preparation, disposing of excess excavated material on the bottom of the pond, and other work incidental thereto, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefor.

   Embankment & Miscellaneous Fill is a **Final Pay Item (F)** as defined in the Standard Specifications. The Contractor shall perform their own calculations based upon their methods of operation and adjust the unit price per cubic yard accordingly.

7. **Import Miscellaneous Fill Material** shall be paid for at the contract in-place compacted **cubic yard** unit price which shall include all labor, materials, equipment, and trucking necessary to procure and import off-site suitable fill materials from a material supplier as necessary to complete the Embankment & Miscellaneous Fill (Bid Item 4) work, and other work incidental thereto, complete in accordance with the Project Plans, these special Provisions, and no additional compensation will be made therefor.

   The estimated quantity of Import Miscellaneous Fill Material is for bidding purposes only. This quantity may be increased, decreased or eliminated in its entirety based on field condition evaluation by the Engineer, and no adjustment in the contract bid price or other contract items will be made therefor. In the event of an increase or a decrease in the amount of the Engineer's estimated quantity of Import Miscellaneous Fill Material, such increase or decrease shall not be considered an alteration in excess of the 25 percent of the contract amount of such items under provisions of Section 4-1.03B of the Standard Specifications and no adjustment of the contract price for Import Miscellaneous Fill Material will be made by reason of such increase or decrease.

8. **Main Tie-In** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools and equipment including potholing; location and verification of existing underground facilities; removal of existing blind flange; dewatering the existing main and the handling and disposal of water as necessary;

disposal of soil and groundwater if required; contamination awareness; removal of existing appurtenances; excavation, backfill and compaction; fittings and appurtenances; leakage testing of the tie-in piping, and other work incidental thereto, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

9. **24" Ductile Iron Pipe, Fittings & Appurtenances** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, and equipment, including all pipe, couplings, fittings, sleeves, restraints, bedding, backfill, appurtenances, and for doing all work involved in constructing the 24" ductile iron pipeline including but not limited to, trenching, restrained joints, tracer wire and boxes, placing and compacting all required bedding and backfill, placement of temporary blow-offs, leakage and hydrostatic testing of the pipeline and appurtenances, cleaning, trench dewatering, disposal of soil and groundwater if required, contamination awareness, and other work incidental thereto, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

10. **Concrete Pipe Encasement** shall be paid for at the contract **linear foot** unit price which shall include all labor, materials, and equipment necessary to construct below ground concrete encasement around existing piping, including but not limited to excavation, housekeeping slab, pipe supports, reinforced concrete, vibration, compaction, finishing and other work incidental thereto, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

11. **24" Mag Meter, Vault & Cover** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, and equipment, including procurement of the magnetic flow meter, precast concrete vault, and vault cover and for doing all work involved in constructing the 24" flow meter vault including but not limited to the magnetic flow meter, precast concrete vault, spring assisted cover, dismantling joint, ductile iron piping, grout, mechanical seals, junction boxes, pipe support(s), excavation, dewatering, disposal of soil and groundwater if required, contamination awareness, and other work incidental thereto, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

12. **24" Butterfly Valve** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in valve installation, including but not limited to excavation, valve, valve box and riser, concrete collar, valve stem riser, pier blocks, placing and compacting all required bedding and backfill, dewatering, disposal of soil and groundwater if required, contamination awareness, and other work

incidental thereto, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

13. **12" Knife Gate Valve** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the procurement, design, fabrication, manufacturing, inspection, shop testing, furnishing, and installation of a Knife Gate, including but not limited to valve, motorized valve actuator, extensions, torque tube, yoke, guide brackets, stem extensions, mounting hardware, handwheel, accessories, appurtenances, and other work incidental thereto necessary to provide a complete and working installation, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

14. **12" Fixed-Cone Dispersion Valve with Hood** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the procurement, design, fabrication, manufacturing, inspection, shop testing, and installation of a Fixed-Cone Dispersion Valve with Hood, including but not limited to energy dissipating fixed-cone dispersion valve, integrally attached baffled discharge hood, motorized valve actuator, extensions, floor stand, guide brackets, stem extensions, mounting hardware, handwheel, accessories, appurtenances, testing, and other work incidental thereto necessary to provide a complete and working installation, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

15. **Stainless Steel Discharge Piping & Appurtenances** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in the procurement, fabrication, manufacturing, inspection, shop testing, and installation of stainless steel discharge piping and appurtenances, including but not limited to pipe, fittings, reducers, thrust rings, coordination with valve manufacturers, flange coupling adapter, restraints, tie rods, anchors, harness lugs, accessories, appurtenances, testing, and other work incidental thereto, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

16. **Discharge Structure, Spillway and Stilling Basin** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing the concrete structures and appurtenances, including but not limited to forming, rebar, concrete, walls, vibration, finishing, curing, protecting, cleaning, waterproofing, grout, mechanical seals, drain pipes, piping coordination, aggregate, hand rails, aluminum grating, miscellaneous metals, and other work incidental

thereto, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

17. **Butterfly Valve Replacement** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in replacing an existing 24” butterfly valve with a City furnished butterfly valve and torque tube assembly, including but not limited to loading and transporting the City furnished equipment, excavation, removal and disposal of existing valve and adjacent piping, butt-strap joint, grout, epoxy coated steel pipe, appurtenances, installation of City furnished equipment, coordination with the City and valve manufacturer, removal and replacement of existing wooden catwalk structure, pier blocks, placing and compacting all required bedding and backfill, dewatering, temporarily plugging the existing Delta Pond inlet pipe as necessary to perform the work, disposal of soil and groundwater if required, contamination awareness, and other work incidental thereto, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

18. **Outlet Flow Meter Replacement** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, and equipment, and incidentals, and for doing all work involved in replacing an existing insertion flow meter with a new 48” magnetic flow meter, removal and disposal of existing meter, transmitter and adjacent piping, butt-strap joint, grout, epoxy coated steel pipe, appurtenances, dewatering the coffer dam structure as necessary to perform the work, and other work incidental thereto, complete in accordance with the Project Plans, these Special Provisions, and no additional allowance will be made therefore.

19. **Electrical from Delta Pond Pump Station to Pedestal** shall be paid for at the contract **linear foot** unit price which shall include full compensation for furnishing all labor, materials, tools, and equipment, including but not limited to trenching, conduit, couplings, fittings, conductors, bedding, backfill, compaction, appurtenances, pull boxes, removal and replacement of the compacted crushed stone (shale) dike roadway, grading, and other work incidental thereto, complete in accordance with the Project Plans or in these Special Provisions, and no additional allowance will be made therefore.

    The length of Electrical from Delta Pond Pump Station to Pedestal will be determined by measuring the total horizontal length of electrical trench between pull box BPP1 and BPP8.

20. **Electrical & Controls Pedestal** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and performing all work involved in furnishing, installing, testing, and starting up an electrical and controls pedestal for operational of the facilities, including but not limited

to, housekeeping pad, anchorage, transportation, testing, electrical connections, and all other related items, completed and in place and operating in accordance with the Project Plans, as specified in these Special Provisions and as directed by the Engineer, and no additional compensation will be made therefor.

21. **General Electrical Work** shall be paid for at the contract **lump sum** fixed price which shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and performing all work involved in providing a complete and working electrical, controls and instrumentation system including, but not limited to protection and preservation of existing electrical equipment; underground conduits and conductors except those specifically included in other items of work; pull boxes; miscellaneous enclosures; all instrumentation connections; telemetry equipment; control and instrumentation conduits and wiring; controls and instrumentation equipment and panels; power feeders; wiring connections; bubbler conduit and tubing; ground rods and underground wiring connections; equipment testing, start up and training of City personnel and all other miscellaneous work, complete in accordance with on the Project Plans, as specified in these Special Provisions and as directed by the Engineer, and no additional compensation will be made therefor.

22. **Rock Riprap & Geotextile** shall be paid for at the contract **square yard** unit price, which shall include full compensation for furnishing all labor, materials, tools, and equipment, and doing all the work involved in furnishing and placing and anchoring geotextile fabric and loose rock riprap including, but not limited to removal and handling of existing rock riprap, removal and disposal of existing geotextile, hauling, placing, grading and other work incidental thereto, complete in accordance with the Project Plans, as specified herein, and as directed by the Engineer, and no additional allowance will be made therefor.

23. **Gravel Roadway Construction** shall be paid for at the contract **square foot** unit price which shall include all labor, materials, and equipment necessary to construct the compacted crushed stone (shale) dike roadway on the top of the embankment using aggregate to the thicknesses indicated on the Project Plans including but not limited to excavation, importing, placing, fine grading, compaction, materials testing, and other work incidental thereto, complete in accordance with the Project Plans and as specified herein, and no additional allowance will be made therefor.

    The estimated quantity of Gravel Roadway Construction is for bidding purposes only. This quantity may be increased, decreased or eliminated in its entirety based on field condition evaluation by the Engineer, and no adjustment in the contract bid price or other contract items will be made therefor. In the event of an increase or a decrease in the amount of the Engineer’s estimated quantity of Gravel Roadway Construction, such increase or decrease shall not be considered an alteration in excess of the

25 percent of the contract amount of such items under provisions of Section 4-1.03B of the Standard Specifications and no adjustment of the contract price for Gravel Roadway Construction will be made by reason of such increase or decrease.

24. **Chain Link Fence** shall be paid for shall be paid for at the contract **linear foot** unit price which shall include full compensation for furnishing all labor, materials, tools and equipment, and doing all work involved in constructing the chain link fence in place, complete as shown on the Project Plans, and as herein specified including all necessary concrete, and no additional allowance will be made therefor.

25. **Dewatering, Trench Shoring & Bracing** shall be paid for at the contract **lump sum** fixed price which shall include all labor, material, and equipment necessary to furnish sheeting, shoring, bracing, and dewatering for the protection of life and limb conforming to applicable safety orders, including but not limited to a bracing and shoring plan *if required*, securing Cal/OSHA permit *if required*, pond water and groundwater disposal plan, pumping of pond water and groundwater, disposal of residual material, cleaning, coordination with City for testing, disposal of pond water and groundwater, and compliance with discharge permit, and no additional allowance will be made therefor.

1.05 PARTIAL OCCUPANCY/UTILIZATION REQUIREMENTS

A. The City may take possession of and use any completed, or partially completed, portion of the Work during the progress of the Work provided possession and use does not interfere with the remaining Work.

B. Possession, use of Work, and placement and installation of equipment by the City shall not in any way evidence the completion of the Work or any part of it.

C. Use and occupancy by the City prior to acceptance of Work does not relieve Contractor of its responsibility to maintain insurance and bonds required under the Contract until entire Work is completed and accepted by the City.

1.06 CONTRACTOR USE OF SITE

A. Confine operations at Site to those areas so designated by Contract Documents, permits, ordinances, and laws.

B. Do not unreasonably encumber Site with materials or equipment.
   1. Coordinate parking, storage, staging, and Work areas with the City.

C. It is imperative that all other existing City facilities continue to operate in compliance with permit requirements throughout the duration of the Work. Contractor shall carry out construction activities in a manner that does not disrupt facility operations.

D. Schedule all construction activities that affect the operation of the facilities with the City. Scheduling of all such activities shall be subject to the approval of the City.

1.07 WORK SEQUENCING AND CONSTRAINTS

A. The work shall be sequenced in accordance with Section 01 35 13 – Part 1.04 of these Technical Specifications prior to the expiration of the working days indicated in Section 8-1.04B of these Contract Special Provisions.

B. Other construction projects may be in progress on-site during this Project. The Contractor shall coordinate his activities with the requirements of the concurrent activities.

C. All work sequencing should be included in the Progress Schedule.

1.08 LIST OF PROJECT PLANS

A. The Contract Project Plans, prepared by Brelje & Race Consulting Civil Engineers, as a basis for the preparation of proposals and for the performance of the work under this contract for the City of Santa Rosa, Geysers-Delta Connection Improvements include:

SHEET NO.	TITLE
1	Cover
2	Abbreviations, Legend, Notes, Sheet Layout & Survey Control Data
3	Site Access, Limits of Work & Erosion Control Plan
4	Connection Facility Site & Layout Plan
5	Grading Plan
6	Piping Plan & Profile
7	Stilling Basin & Spillway Sections & Details
8	Discharge Structure Mechanical Sections & Details
9	Spillway & Stilling Basin Miscellaneous Cross Sections
10	Discharge Structure Miscellaneous Cross Sections
11	Outlet Flow Meter Replacement Site & Piping Plans
12	Butterfly Valve Replacement
13	Miscellaneous Piping Details
14	Miscellaneous Details
15	Stilling Basin Structural Sections & Details
16	Spillway Structural Sections & Details
17	Discharge Structure Structural Sections & Details
18	Electrical Symbols & Abbreviations
19	Pedestal Elevation & One Line Diagram
20	Telemetry Backpan Layout & Elementary Diagrams
21	Typical Electrical Details 1
22	Typical Electrical Details 2
23	Overall Electrical Site Plan

SHEET NO.	TITLE
24	Geysers Delta Valve & Pond Electrical Site Plan
25	Outlet Flow Meter Replacement Electrical Site Plan
26	Instrumentation Symbols & Abbreviations
27	Geysers Delta Valves & Pond P&ID

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Contract General Specifications.

B. Section 01 32 00 – Construction Progress Documentation

1.02 PRECONSTRUCTION CONFERENCE

A. A meeting will be scheduled by the Engineer immediately prior to Contractor move-in. Representatives of the Engineer, the Contractor, selected Subcontractors, and the California Department of Water Resources Division of Safety of Dams (DSOD) must be present. Job site procedures and the following items will be discussed.
   1. Contact information
   2. Responsibilities
      a. Engineer
      b. Construction Observer(s)
      c. City
      d. Contractor
      e. Any other agency contributing to the project
   3. General discussion of contract
      a. Completion time
      b. Payment procedures
      c. Final acceptance
      d. Other requirements of contract
   4. Contractor's schedule
   5. Sub-contracts
   6. Project observation
   7. Safety

1.03 PROGRESS MEETINGS

A. A meeting will be conducted weekly, by the City's Representative and/or the Engineer to coordinate the work. The Contractor's Representative and the Contractor's Superintendent shall be in attendance. DSOD shall be notified of all progress meetings for attendance on an as needed basis.

B. The meeting will be held in the job office or other designated location on a regularly scheduled basis. The date and hour will be announced by the Engineer's Representative.

C. Contractor is to provide a 3 week look ahead schedule in accordance with Section 01 32 00 – Construction Progress Documentation. This schedule shall be updated weekly as necessary. The City's Representative and Engineer shall review this schedule to identify any early scheduling changes and/or conflicts.

D. Standard Site-Meeting Agenda

1. Job Status / Schedule
   a. Construction schedule
   b. Contract schedule / time
   c. Budget status
2. Status of Contractor Base Schedule
   a. Long-lead procurement items affecting schedule
   b. City induced delays, if any
   c. Contractor caused delays, if any
   d. RFIs - review responses affecting schedule
   e. Shop drawing - review submittals and/or responses affecting schedule
   f. Change Order items, if any.
3. Old Business
4. New Business
5. Non-conformance Items / Work
6. Status of Record Drawings
7. Other Current Problem Areas / Resolutions
8. Environmental / Safety Considerations
9. Change Order Meeting

E. The essence of the discussion of each meeting will be entered into the minutes and copies will be furnished by the City's Representative or the Engineer to all interested parties within one week.

1.04 PROJECT CLOSE-OUT MEETING

A. Approximately two (2) to six (6) weeks prior to the scheduled completion of the Project, for the convenience of the contractor, the City's Representative will include in the standard meeting agenda a Project Close-out meeting.

B. The purpose is to produce an action-list of major items required to be completed prior to the issuance of the Notice of Completion.

1. The action-list shall assign an action-responsibility and a projected action-completion date to each item.
2. The contractor shall be solely responsible for the timely completion of all required close-out items.

3. Items to be considered include:
    - Punch list
    - Keys/Keying
    - Record drawings and specifications
    - Test record documentation
    - Inspections
    - Removal of temporary facilities
    - Final cleaning
    - Acceptance
    - Notice of completion
    - Final payment
    - Other close-out items

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes a description of the construction progress documentation required of the Contractor.

1.02 RELATED SECTIONS

A. Contract General Specifications.

B. Section 01 31 19 – Project Meetings

C. Section 01 33 00 – Submittals

D. Section 01 35 13 – Special Project Procedures

1.03 PROGRESS SCHEDULE

A. Submit a detailed Progress Schedule that includes all work associated with the project from the initial Notice to Proceed to the Final Completion. This includes all phases of the work.

B. Show the duration and sequencing of activities required for complete performance of the Work.

C. The schedule must be approved by the Engineer and updates to the schedule will be required throughout the project to reflect actual progress and occurrences to date.

1. Updates shall show work that has been completed prior to submission.
2. Updates shall show at a minimum all approved changes, delays, modified sequencing, and progress projection changes.

D. Detailed sub-schedules shall be available upon request of the Engineer to further define critical portions of the Work such as facility shutdowns.

E. The schedule shall be presented in digital Bar Chart format from Microsoft Project or an approved equal program.

1.04 SCHEDULE SUBMITTAL AND CONTENTS

A. Format:

1. Submitted in 11 x 17 sheet size in paper format and electronically.
2. Title block shall show the name of the project, the City, and date submitted.

3. Timeline shall be identified horizontally across the top of the schedule; the timeline shall include the year, month, and day.
4. Each activity shall have a unique number and bar associated.
5. Each schedule shall include a legend describing all standard and special symbols used.

B. Contents:

1. The contents shall include, in a chronological timeline order, in conformance with the Contractor's Work Plan, the activities reasonably required to complete the Work, including, but not limited to:
   a. Submittals
   b. Mobilization
   c. Specific Work
   d. Completion Dates
   e. Subcontract Work
   f. Milestones
   g. Delivery Dates
   h. Site Preparation
   i. Excavation Work
   j. Concrete Forming and Structure Work
   k. Pipe and Valve Work
   l. Miscellaneous Fill
   m. General Earthwork Operations
   n. Geotextile Installation
   o. Rip-Rap Installation
   p. Gravel Roadway Construction
   q. Closeout and Cleanup
   r. Demobilization

C. Acceptance of Schedules:

1. If a schedule is not accepted by the Engineer a revised schedule must be resubmitted within ten days.
2. All submittal criteria must be present for the schedule to be accepted.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the administrative and procedural requirements for submittals required for performance of the Work:

1. Submittal schedule
2. Submittal procedures
3. Shop drawings
4. Product data
5. Samples
6. Engineer's action

B. Shop Drawings, Product Data, Calculations, and Samples shall be submitted by the Contractor for review by the Engineer prior to delivery to the job site. Materials and services requiring submittals shall include but not be limited to the following:

1. Contractor's Construction Schedule
2. Submittal Schedule
3. Shop Drawings
4. Product Data
5. Samples
6. Work Plan(s)
7. Quality Control Plan
8. Schedule and Sequence of Operations
9. Reports
10. Pipe
11. Pipe Appurtenances
12. Valves and Operators
13. Pipe Supports
14. Reinforcement
15. Concrete Mix Design
16. Dewatering Plan

17. Structures
18. Shoring and Bracing
19. Rock Riprap
20. Geotextile
21. Crushed Stone (Shale) Surfacing
22. Chain Link Fencing

C. Administrative Submittals: Refer to the General Specifications and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
   1. Permits
   2. Applications for payment
   3. Performance and payment bonds
   4. Insurance certificates
   5. List of subcontractors

D. DSOD Submittals:
   1. Various submittals may require the approval of the DSOD. The following submittals will require the approval of the DSOD:
      a. Concrete Mix Design
      b. Shop Drawings
      c. Work Plans
      d. Dewatering Plan
      e. Structures
      f. Shoring and Bracing
   2. Following Engineers approval, the Contractor shall allow 10 working days for review of submittals requiring DSOD approval.

1.02 RELATED SECTIONS

A. General Specifications

B. Section 01 32 00 – Construction Progress Documentation

C. Section 01 35 13 – Special Project Procedures

D. Section 03 30 01 – Concrete and Reinforcement

E. Section 05 50 00 – Metal Fabrications

F. Section 05 51 00 – Metal Railings and Gratings

G. Section 31 23 19 – Dewatering

H. Section 31 35 19 – Geosynthetics

I. Section 31 37 00 –Rock Riprap

J. Section 31 40 00 – Shoring and Bracing

K. Section 33 05 15 – Precast Concrete Utility Structures and Covers

L. Section 33 11 10 – Pipe and Appurtenances

M. Section 33 12 16 – Valves

N. Section 32 15 40 – Crushed Stone (Shale) Surfacing

1.03 SUBMITTAL PROCEDURES

A. Coordination

1. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance related construction activities to avoid delay.
2. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
3. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
   a. The Engineer shall return without action any submittals requiring coordination with other submittals until related submittals are coordinated.
4. Allow sufficient review time so that installation will not be delayed because of the time required to process submittals, including time for resubmittals:
   a. See General Specifications for additional requirements.
   b. If an intermediate submittal is necessary, process the same as the initial submittal.
   c. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.

B. Place a permanent label or title block on each submittal for identification.

1. Provide a space approximately 4” x 5” on the label or beside the title block on Shop Drawings to record the Contractor’s review and approval markings and the action taken.
2. Include the following information on the label for processing and recording action taken:
   a. Project name
   b. Date

c. Name and address of Engineer
d. Name and address of Contractor
e. Name and address of subcontractor
f. Name and address of supplier
g. Name of manufacturer
h. Number and title of appropriate Specification Section
i. Drawing number and detail references, as appropriate.

C. Submittal Transmittal:

1. Submittals shall be delivered electronically.
2. Transmit each submittal from Contractor to Engineer using a transmittal form.
   a. Record relevant information and requests for data.
   b. Record deviations from Contract Document requirements, including minor variations and limitations.
   c. Include Contractor's certification that information complies with Contract
3. Submittals received from sources other than the Contractor will be returned without action.

1.04 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale.

B. Highlight, encircle, or otherwise indicate deviations from the Contract Documents.

C. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

D. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. Dimensions
2. Identification of products and materials included
3. Compliance with specified standards
4. Notation of coordination requirements
5. Notation of dimensions established by field measurement.

E. Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets electronically formatted to at least 8-1/2" x 11" but no larger than 22" x 34".

F. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.05 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as:

1. Manufacturer's installation instructions
2. Catalog cuts
3. Standard color charts
4. Roughing-in diagrams and templates
5. Performance curves

B. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

C. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark to indicate the applicable information. Include the following information:

1. Manufacturer's printed recommendations,
2. Compliance with recognized trade association standards,
3. Compliance with recognized testing agency standards,
4. Application of testing agency labels and seals,
5. Notation of dimensions verified by field measurement,
6. Notation of coordination requirements.

D. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.06 SCHEDULE AND SEQUENCE OF OPERATIONS

A. The Contractor shall submit a detailed schedule and sequence of operations in a bar chart format as specified in Section 01 32 00 – Construction Progress Documentation.

B. The Contractor shall submit a detailed work plan as specified in Section 01 35 13 – Special Project Procedures.

1.07 REPORTS

A. The following information shall be submitted to the Engineer on a regular schedule during the progress of the work:

1. Daily reports shall be submitted by noon of the day following the date of the report.
2. Laboratory test results shall be submitted within two days of receipt of the report from the laboratory.
3. Final reports shall be submitted within two to four weeks of the completion of work.

B. DSOD shall be notified immediately in the event of a failing compaction test so corrective action can be taken as soon as possible.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 35 13

SPECIAL PROJECT PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. The requirements for the following subjects are included in this Section:

1. Inspectors
2. Existing System Operation
3. Work Plan
4. General Environmental Protections
5. Stormwater Controls (SWPPP)
6. Unused Material

1.02 RELATED DOCUMENTS

A. General Specifications

B. Section 01 50 00 – Temporary Facilities and Controls

C. Section 31 23 00 – Excavation and Fill

D. Section 31 25 13 – Erosion Controls

1.03 INSPECTORS

A. Representatives from DSOD will periodically inspect the work in progress during construction, including the materials being incorporated into the works, as well as the test results and documentation associated with the project. Upon completion of any excavation, DSOD approval of the foundation surface will be required before embankment fill starts. The contractor shall allow DSOD representatives access to all locations within project boundaries. All communications with DSOD pertaining to the project shall be coordinated through the City's designated representative. The contractor shall cooperate with the City's representative by giving 72 business hours notice of any inspection or review that is required to be performed by DSOD to avoid delaying the work and assure that the City's representative has sufficient time to coordinate DSOD's involvement.

1.04 EXISTING SYSTEM OPERATION

A. Delta Pond will be taken out of service and the water level in the pond lowered to elevation 54.0 as indicated on the Project Plans by August 1, 2022, at which time the Contractor may commence with the work. The pond

and pump station will remain in service with the pond water service at elevation 54.0 throughout construction.

1.05 WORK PLAN

A. The Contractor shall submit a detailed work plan that includes a complete written description of the procedure(s) to be used in construction. The work plan shall describe the proposed operating procedures, construction equipment, sequencing, and schedules. This shall include, but not be limited to, the Contractor's plan for:

1. Coordinating the construction, maintenance and removal of temporary construction access and working areas, with the Engineer, and other contractors on site.
2. Site preparation procedures
3. Embankment excavation procedures
4. Foundation preparation
5. Concrete structure construction.
6. Pipe and valve installation.
7. Embankment fill and finished grading.
8. Geotextile installation procedures.
9. Riprap installation procedures.
10. Outlet flow meter replacement work plans.
11. DV1 butterfly valve replacement work plan.
12. Material properties, sources, and (manufacturer's) certificates of quality.
13. Clean-up.

B. Submit work plans for items 1.05 A 3 through 12 to DSOD. Allow 10 business days for review and approval.

1.06 GENERAL ENVIRONMENTAL PROTECTIONS

A. An Initial Study and Mitigated Negative Declaration has been prepared and adopted for the project which requires the project to implement the mitigation measures listed in a Mitigation Monitoring and Reporting Plan (MMRP). A copy of the Geysers-Delta Pond Improvements Project Initial Study/Mitigated Negative Declaration prepared by Analytical Environmental Services, dated November 2021 is available for review at the Department of Transportation and Public Works, and labeled "IS/MND" at the City's CPE website; https://cippublic.srcity.org/ProjPages/2111.html. The Contractor shall comply with all applicable requirements of the MMRP which are summarized in the following subsections:

B. **AIR QUALITY**

1. The Contractor shall water all exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) two times per day.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4. All vehicle speeds on unpaved roads shall be limited to 15 mph.
5. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxics Control Measure CCR Title 13, Section 2485). The contractor shall provide clear signage for construction workers at all access points to the project areas.
6. All construction equipment shall be maintained and properly tuned in accordance with manufacturer‘s specifications. All equipment shall be checked by a certified visible emissions evaluator.
7. The Contractor shall provide and post a publicly visible sign at Willowside Road with the telephone number and person to contact regarding dust complaints. This person shall respond and take corrective action within 48 hours. The BAAQMD phone number shall also be visible to ensure compliance with applicable regulations.

C. **BIOLOGICAL RESOURCES**

1. The City’s biologist will conduct a pre-construction survey of the project site for all terrestrial special-status species listed as having a potential to occur within the project site within 14 days prior to ground-disturbing activities. The Contractor shall provide 14 days advanced notification prior to the planned commencement of any construction activities. The City will coordinate with the applicable agencies if special status species or habitat suitable to support the special status species are identified.
2. The Contractor shall install exclusionary temporary construction fencing to prevent the entrance of special status species within the work areas. Fencing shall be installed under the observation and direction of the City’s biologist at the locations indicated on the Project Plans. If special status species were identified within the work area during the pre-construction survey, the Contractor shall install One-Way Escape Gateways as directed by the City’s biologist to allow the special status species to move out of the work area.
3. The Contractor shall coordinate and schedule all ground-disturbing activities with the City’s biological monitor. The Contractor shall allow observation by the City’s biological monitor during all ground disturbing activities to ensure “take” of special-status species does not occur.

4. The Contractor shall allow the City's biological monitor to conduct daily inspections of the work area and all construction related equipment for special-status species prior to the start of daily construction activities.
5. Preconstruction nesting bird surveys are required for construction beginning during the nesting season of February 15 through September 15. These surveys must be performed within 14 days of commencing construction during the nesting season. The Contractor shall coordinate the scheduling of nesting bird surveys based on their construction schedule. If work starts after two weeks from the last nesting bird survey you must schedule a new survey prior to starting work.
    a. The City's Biologist will conduct the nesting bird surveys prior to construction. If nesting birds are found, the Contractor must cease work in the nesting area until further evaluation by the City's Biologist and given approval to resume work in the area.
    b. In the event that nesting birds are found within areas potentially affected by project activities during the nesting season, the nest site(s) shall be protected by a non-disturbance buffer established by the City's Biologist. The buffer shall remain in place until fledging is complete.
6. Tree trimming and removal will not be allowed.

D. **CULTURAL RESOURCES**

1. The Contractor shall coordinate and schedule all ground-disturbing activities with the City's Archaeologist and Native American monitor. The Contractor shall allow observation of all ground disturbing activities.
    a. The Engineer, City's Archaeologist, Native American monitor, and/or Tribal representative shall have the authority to halt work in the event of a cultural resources discovery.
    b. If cultural materials or features are found, all work within 50 feet of the find shall halt until the monitoring team can identify the materials, determine their possible significance, and formulate appropriate measures for their treatment; these measures shall be implemented by the City prior to the resumption of construction.
2. If any paleontological resources (i.e., fossils) are found, all work in the immediate vicinity must stop and the Engineer and City must immediately be notified.
    a. If discovered, a qualified paleontologist will be retained by the City to evaluate the find and recommend appropriate mitigation measures for the inadvertently discovered paleontological resources.
3. If human remains are discovered, all work shall halt within 50 feet of the human remains and the Engineer, City, and County coroner must immediately be notified:
    a. The procedures for the treatment of discovered human remains are contained in California Health and Safety Code §§ 7050.5 and 7052 and PRC § 5097. If the remains are determined to be Native American, the coroner will notify the Native American Heritage Commission.

E. **HAZARDS AND HAZARDOUS MATERIALS**

1. Construction equipment shall contain spark arrestors, as provided by the manufacturer.
2. Staging areas, welding areas, or areas slated for development using spark-producing equipment shall be cleared of dried vegetation or other materials that could serve as fire fuel.
3. During construction, the project site shall be cleaned daily of trash and debris to the maximum extent practicable.

1.07 UNUSED MATERIAL

A. Unused material shall be uniformly spread, graded, and compacted to a minimum 85% relative compaction on the pond bottom as directed by the Engineer.

B. Material shall be placed and spread at locations as directed by the Engineer within the pond bottom at a maximum slope of 2% and with a finished thickness of not greater than 1-foot.

C. Material placed on the pond bottom shall be graded to a surface profile that will not cause water to puddle or pond and promotes drainage towards the middle of the pond.

D. No existing material shall be removed from the site.

1.08 STORMWATER CONTROLS

A. This project combined with the adjacent Delta Pond Diffuser Maintenance Project will disturb more than one acre. Therefore, this project is not exempt from the State Water Resources Control Board General NPDES Permit for the Discharge of Storm Water related to Construction Activities (Construction General Permit) and the Contractor will be require to prepare and comply with the requirements of a Storm Water pollution Prevention Plan (SWPPP). The SWPPP shall be prepared by a Qualified Stormwater Designer (QSD). See Section 31 25 13 – Erosion Controls for additional requirements.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 42 15

ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Contract General Specifications

1.02 DEFINITIONS

A. General: Basic Contract definitions are included in the Contract Documents and General Specifications.

B. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Project Plans, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.

C. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Engineer, requested by the Engineer, and similar phrases.

D. Approve: The term approved, when used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulation: The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term furnish means supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. Install or Construct: The terms install or construct describe operations at the Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. Provide: The term provide means to furnish and install, complete and ready for the intended use.

I. Installer: An Installer is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection,

application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

J. The Site is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other work as part of the Project.

K. Testing Agencies: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.03 SPECIFICATION CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 17-Division format.

B. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but not assured, to be accurate and up to date as of date of Contract Documents.

1. Abbreviations used to identify Reference Standards and Departments:

ACI	American Concrete Institute
AI	Asphalt Institute
AIA	American Institute of Architects
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	ASTM International (Formerly American Society for Testing and Materials. Still occasionally used in specifications.)
AWS	American Welding Society
AWWA	American Water Works Association
CCR	California Code of Regulations
CSI	Construction Specifications Institute
DSOD	California Department of Water Resources Division of Safety of
CDFW	State of California Department of Fish and Wildlife
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
NEC	National Electrical Code
NFPA	National Fire Protection Association
PCA	Portland Cement Association
RWQCB	State of California Regional Water Quality Board
SSPC	Steel Structures Painting Council
UBC	Uniform Building Code (ICBO)
UL	Underwriters Laboratories, Inc.

2. Abbreviations and units of measurement used in the Specifications in addition to those outlined in the Standard Specifications:

Symbols as used in the Specifications	Symbols as used in the Engineer's Estimate	Definitions
atm	—	atmosphere
bcy	BCY	bank or in-situ cubic yard or yards
Btu	—	British thermal unit or units
cu.ft. or cf	CF	cubic foot or feet
C	—	degrees Celsius
CB	—	Cement -Bentonite
cfm	—	cubic feet per minute
CL	—	center line
cu	—	cubic
cu.yd or cy	CY	bank or in-situ cubic yard or yards
db	—	decibles
F	—	degrees Fahrenheit
ft	—	feet or foot
gal	—	gallon or gallons
gpm	—	gallons per minute
hp	—	horsepower
hr	—	hour or hours (english units)
Hz	—	hertz
ID	—	inside diameter
lb or lbs	LB	pound or pounds (weight)
mfr	—	manufacturer
mg	—	milligram or milligrams
mgd	—	million gallons per day
mg/l	—	milligrams per liter
min	—	minute
oc	—	on center
OD	—	outside diameter
ppm	—	parts per million
psf	—	pounds per square foot
psi	—	pounds per square inch
psia	—	pounds per square inch absolute
psig	—	pounds per square inch gauge
PVC	—	polyvinyl chloride
R	—	radius
sq	—	square
sq.ft. or sf	SF	square foot or feet
sq.sy. or sy	SY	square yard or yards

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing all labor, materials, equipment, tools and incidentals and performing all operations necessary to perform and conform to the following:

1. Construction Staking and Control
2. Rights-of-way and Contractor's access
3. Public Convenience and Safety
4. Temporary Utilities

1.02 RELATED SECTIONS

A. Contract General Specifications

1.03 CONSTRUCTION STAKING AND CONTROL

A. The City will provide staking within two business days of Contractor's request for staking. The City will provide engineering surveys to establish construction stakes that in the City's judgment are necessary to enable Contractor to proceed with the work.

B. The City will provide the following set of stakes:

1. Excavation Staking
2. Embankment Fill Staking
3. Pond Bottom Grading Staking
4. Control Alignment Centerline Staking
5. Pipeline Staking
6. Discharge Structure, Spillway and Stilling Basin Staking

C. If the Contractor finds any additional staking or corrections necessary, notify the City in writing within two business days of the discovery.

D. Contractor shall be responsible for laying out the Work, shall protect and preserve the established construction stakes and control, and shall make no changes or relocations without the prior written approval of the City.

E. Whenever Contractor knows or reasonably should know that any Work activity is likely to damage or destroy any construction stakes or control, or

require relocation because of necessary changes in grades or locations, provide 2 Business Days advance notice to the City.

F. Notify the City whenever any construction stakes or property monuments are lost or destroyed or require relocation because of necessary changes in grades or locations. The City shall replace or repair construction stakes or property monuments at Contractor's expense. Lost, destroyed or relocation of stakes and monuments shall not constitute a basis for claim for damages or extension of time.

1.04 RIGHTS-OF-WAY AND CONTRACTOR'S ACCESS

A. Contractor's access is available to the project site from Willowside Road as shown on the Project Plans.

B. The Contractor shall allow access to the existing dike roads where work is not taking place.

C. The existing approximately 3,200 foot long gravel access road from Willowside Road shall be kept free of construction equipment and materials. The Contractor shall maintain the existing access road during construction and restore it to its existing condition prior to construction or better following the completion of the work.

1. The Contractor shall obtain a revocable license from Sonoma Water (formally known as Sonoma County Water Agency (SCWA)). A copy of the City's Revocable License with Sonoma Water is included in Appendix A.

2. The existing gravel access roads may be used by others during the construction period including but not limited to City personnel, adjacent contractors working on the adjacent Delta Pond Diffuser Maintenance Project, pedestrians, and Water Agency personnel. The Contractor is responsible for coordinating with others for use of the existing gravel access roads during construction. Vehicles shall remain within the limits of the existing gravel road. Passing of construction vehicles on the one-way access road is prohibited (i.e. at any given moment in time, all vehicles on the road must be traveling in the same direction).

1.05 PUBLIC CONVENIENCE AND SAFETY

A. Traffic and circulation

1. If any applicable permits require the Contractor to notify residents or any agency of traffic detours and/or delays, then Contractor shall provide the Engineer a copy of all such notices.

B. Maintaining through traffic

1. The fact that rain or other causes, either within or beyond the control of the Contractor, may force suspension or delay of the work, shall in no way relieve the Contractor of responsibility for maintaining traffic and providing local access as specified herein.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 70 00

PROJECT CLOSE-OUT

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for project close-out, including but not limited to the following:

1. Punch-list inspection procedures
2. Record Drawing submittals
3. Submittal of permits and regulatory inspection reports
4. Final completion

1.02 RELATED DOCUMENTS

A. Contract General Specifications

B. Section 01 11 00 – Summary of Work.

C. Section 01 31 19 – Project Meetings

D. Section 01 33 00 – Submittals

E. Section 01 74 10 – Cleanup

1.03 PUNCH-LIST INSPECTION

A. When each portion of the Work is, in the opinion of the Contractor, complete in all respects, the Contractor shall call for a punch-list inspection.

B. Inspection Procedures: On receipt of a request for inspection, the City's Engineer will schedule the Inspection. The Engineer will then perform a preliminary, walk-through. If, in the judgment of the Engineer, the project is not sufficiently complete in all respects, the Engineer will so advise the Contractor and discontinue the inspection.

1. The Engineer will repeat inspection when requested and assured that the work has been completed.
2. Results of the completed inspection will form the basis of requirements for final acceptance punch-list.

1.04 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to

record documents for the City's and the Engineer's reference during normal working hours.

B. Record Project Plans: Maintain a clean, undamaged set of blue or black line white-prints of Contract Project Plans and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Project Plans. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

   1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
   2. Mark new information that is important to the City, but was not shown on Contract Project Plans or Shop Drawings.
   3. Note related Change Order numbers where applicable.
   4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, contact information and other identification on the cover of each set.
   5. Upon completion of the work, submit Record Project Plans to the Engineer for further processing.

C. Spare Parts/Materials: Submit all required spare parts and material required by the Contract Documents.

D. Submittal of Warranties: Submit all equipment and material warranties required by the Contract Documents.

E. Permits and Regulatory Inspection Reports: Submit a copy of each permit obtained for the project with all associated information including, but not limited to permit application forms, inspection reports, regulatory authorizations, Notice of Intent, and notice of completions.

F. Commissioning/equipment testing and startup: Conduct all required equipment testing and startup to the satisfaction of the City and provide all testing and startup reports and forms.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for certification of acceptance of final completion submit a certified copy of the Engineer's final inspection list of items to be completed or corrected, stating that each item has

been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Engineer.

B. Re-inspection Procedure: The Engineer will re-inspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, (punch-list), has been completed, except items whose completion has been delayed because of circumstances acceptable to the City.

   1. Upon completion of re-inspection, the Engineer will prepare and submit to the City, a recommendation of final acceptance, or advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final completion.

C. See additional requirements for final completion in the General Specifications.

END OF SECTION

SECTION 01 74 10

CLEANUP

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing all labor, materials, equipment, tools, and incidentals and performing all operations to conduct clean-up activities and responsibilities during construction and prior to final acceptance.

1.02 RELATED SECTIONS

A. Section 01 35 13 – Special Project Procedures

B. Section 01 70 00 – Project Close-Out

C. Section 31 25 13 – Erosion Controls

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL PROCEDURES

A. The construction area shall be kept free of rubbish, waste materials, and packing materials. All waste materials shall be disposed of as soon as possible.

B. Easements, rights-of-way and temporary access routes shall be kept free of all waste materials, unused pipe, excessive dirt and dust. Fences shall be protected during construction and repaired to the City's satisfaction immediately following Site work and underground construction. All large rocks, clods, broken pipe and unused materials shall be removed from the work Site during construction and during final cleanup.

C. The Site shall be completely cleaned prior to final acceptance.

D. Final cleanup shall include the removal and disposal of all foreign material, paper, rubbish, rocks, clods, excess pipe, asphalt, wood, metal, and all other excess miscellaneous construction material.

E. All asphalt pavement shall be swept clean.

F. All cut and fill slopes, trenches, stockpiles and area where the natural ground has been disturbed shall be left with a smooth, clean appearance.

G. Drainage ditches shall be kept open during times rain is expected.

H. Excavated on-site materials not suitable for backfilling shall be uniformly spread on the pond bottom as indicated in Section 31 23 00 – Excavation and Fill, Part 3 – Execution, Unused Earthwork Material.

END OF SECTION

SECTION 01 75 05

START-UP, TESTING AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing all labor, materials, transportation, tools, supplies, plant, equipment and appurtenances necessary to perform start-up, and testing of all the mechanical, piping, and instrumentation equipment and systems installed and/or modified during the course of the work.

1.02 RELATED SECTIONS

A. Section 33 10 05 – Basic Piping Materials and Methods

B. Section 33 12 16 – Basic Valve Materials and Methods

1.03 SUBMITTALS

A. A schedule for the functional and performance testing and Facility Start-up updated monthly (weekly when testing is taking place).

B. Equipment Testing Procedures and Testing Log sheets to be used during functional and performance testing for each equipment item and system and for Facility Start-up.

C. Calibration and test results, documented as required by the test program, of equipment or system prior to commencement of facility start-up or training.

1. Credentials and certification of the Contractor's testing laboratory for calibration of all test equipment.
2. Mechanical and utility system test documentation

D. The original and three copies of all records produced during the Testing Program.

E. Completed Equipment Test Report forms and log sheets for each piece of equipment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Start-up, and testing shall be considered to include the following described stages of work.

1. Functional testing: Performed in the presence of the Engineer to demonstrate that the installed equipment meets the manufacturer's installation, adjustment and functional requirements including but not limited to proper mechanical connections, thrust restraint, rotation, alignment, vibration and noise.
2. Performance testing: Performed in the presence of the Engineer following successful completion of the functional test to demonstrate and prove that the equipment meets the specified performance requirements.
3. Facility start-up: Coordinated operation and final adjusting of the complete facility, in the presence of the Engineer, by the Contractor, subcontractors, and City's operating personnel following successful completion of all functional and performance testing.
4. Training of the City's personnel shall take place following successful completion of all functional and performance tests and facility Start-up.

3.02 PREPARATION

A. The Contractor shall complete all of the following prior to beginning any testing or start-up:

1. All work associated with the installation of the equipment and related systems.
2. Furnish operating and maintenance manuals.
3. Schedule and retain the services of the manufacturer's representative when specified.
4. Test all connected piping as specified in the applicable Sections of these Special Provisions. Pressure and leakage tests shall be completed prior to any testing of connected mechanical equipment, valves, or concrete encasement.
5. Have all gauges, test equipment, temporary piping and valves and other necessary devices calibrated and on-hand.
6. Notify Engineer in writing at least 10 days in advance of test.
7. Submit to Engineer at least 10 days in advance, the proposed Equipment Testing Procedures and Testing Log sheets for review and approval.
   a. Proposed Equipment Testing Procedures shall be presented in chronological outline format, with a detailed description of each individual test procedure to be conducted during functional and performance testing.

b. Before startup and performance testing of equipment systems can be initiated, functional testing shall be completed as specified for each individual equipment item.

8. Prior to testing, inspect and clean equipment, devices, connected piping, and structures to ensure they are free of foreign material.
9. Flush lubrication systems and dispose of flushing oils if required. Recharge lubrication system with lubricant recommended by manufacturer.
10. Remove temporary supports, bracing, or other foreign objects installed to prevent damage during shipment, storage, and erection.

3.03 TESTS FOR MECHANICAL SYSTEMS

A. All mechanical systems shall be tested as specified in the individual equipment specification Sections and as follows:

1. Ensure and demonstrate that equipment and valves operate properly and reliably. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
2. Inspect manual and motorized valves for proper adjustment. Verify valve seats are positioned for proper flow direction.

END OF SECTION

SECTION 03 30 01

CONCRETE AND REINFORCEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete associated with the construction of the following:

1. Concrete structures
2. Concrete pipe encasement
3. Reinforcing steel and accessories
4. Screw anchors and anchor bolts
5. Anchor and thrust blocks
6. Formwork, bracing and anchorage

1.02 RELATED SECTIONS

A. Section 33 11 10 – Pipe and Appurtenances

B. Section 33 12 16 – Basic Valve Materials and Methods

C. Section 33 05 15 – Precast Concrete Utility Structures and Covers

1.03 SUBMITTALS

A. Submittals shall include the following requirements:

1. Concrete mix design
   a. Concrete shall not be placed until the submitted mix design has been approved by the Engineer and DSOD.
2. Methods of application and equipment.
3. Reinforcing bar product data
4. Certificate of compliance for materials, curing compounds, and membranes
5. Weighmaster Certificate for each load of concrete delivered to the jobsite showing mix identification number, non-repeating load number, date and time materials were batched, total quantity of water added to the load, the revolution counter reading at the time the truck mixer is charged with cement, and actual scale weight in pounds for the ingredients batched.
6. Screw anchors and anchor bolt data

PART 2 PRODUCTS

2.01 MATERIALS

A. Formwork materials shall be Douglas fir plywood or dimensional lumber.

B. Reinforcing steel: ASTM A 615, Grade 60 deformed bars, plain finish. Steel shall be kept clean and free of rust.

C. Concrete: Concrete shall contain no less than 590 pounds of cementitious materials per cubic yard and meet the minimum ultimate compressive strengths at twenty-eight (28) days as indicated on the Project Plans.

D. Mix Design: Concrete mix design and testing shall meet the requirements of Section 1905 and 1704 of the 2007 California Building Code, and these specifications.

E. Concrete per City Specification Section 90 may be used for thrust blocking and valve box collars.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. The subgrade of concrete structures shall conform to the requirements of embankment fill as described in Section 31 23 00. Following excavation of the embankment, compaction testing will be performed to verify that the existing embankment foundation conforms to the requirements of Section 31 23 00.

3.02 FORMING

A. Arrange and assemble formwork, utilizing form oil, to permit easy dismantling and stripping, and to prevent damage to concrete during formwork removal. Formwork shall be tight fitting and adequately stiffened to support weight of concrete without deflection.

B. A 1H:10V slope batter shall be provided on all vertically formed concrete where backfill will be compacted against.

3.03 SURFACE FINISHES

A. Ordinary Surface Finish

1. Ordinary surface finish shall be formed surfaces with defects repaired in accordance with this Section of these specifications.

2. In additions, all edges between horizontal and vertical surfaces, including tops of walls and edges of slabs shall be finished with a 1/4-inch radius

trowel as a part of ordinary surface finish. Larger radii shall be required where shown on plans.

3. Sidewalks or concrete slabs poured directly on ground or base material shall have score lines as per common practice to facilitate expected shrinkage cracking. The weakened plane scores shall be 1/8 inch wide by 3/4 inch deep in the slope protection lining and 1/8 inch wide by 1-1/4 inch deep in the curb.
4. Ordinary surface finish shall be applied to all formed concrete surfaces either as a final finish or preparatory to a higher class finish.
5. Ordinary surface finish shall be a final finish for all exterior formed surfaces which are to be buried underground or covered with embankment.

B. Class 1 Finish

1. Class 1 Finish shall be a smooth steel trowel finish of uniform texture and appearance, free from unsightly budges, depressions and other imperfections.
2. Class 1 Finish shall be the final finish on the following surfaces:
   a. Interior horizontal surfaces of building slabs, structures and boxes.

C. Class 2 Finish

1. Class 2 Finish shall be a fine broom finish to produce a non-skid surface. Surfaces requiring a Class 2 Finish shall be brought up to Class 1 Finish requirements and then lightly broomed as required to produce the non-skid surface.
2. Class 2 Finish shall be the final finish on the following surfaces:
   a. Exterior horizontal surfaces including walkways, slabs, and tops of walls.

D. Class 3 Finish

1. Class 3 Finish shall be a smooth finish of uniform texture and appearance, free from unsightly bulges, depressions and other imperfections comparable to Class 1 Finish except Class 3 Finish shall be applied to vertical formed surfaces.
2. After forms are removed and defects repaired as previously provided, the surface shall be wetted and dry cement shall be hand rubbed into the surface with the aid of a burlap sack. The surface shall then be sanded with power sanders or other approved abrasive means until a smooth, even surface of uniform texture is obtained.
3. Class 3 Finish shall be the final finish on the following surfaces:
   a. Interior and exterior vertical formed surfaces, anchor blocks.
   b. Exterior Horizontal Slab Surfaces: Broom finish.

E. Construction Joint Finish

1. The surface of construction joints shall be wood float finished only.
2. The interface between concrete surfaces at all construction joints shall be adequately abraded/roughened to the satisfaction of the Engineer. The surface amplitude of the roughened concrete surface shall be a minimum of 1/8-inch. This includes the interface between existing and new concrete surfaces.
3. Construction joints shall have all laitance removed and the aggregate exposed by wet or dry sandblasting prior to concrete placement.

3.04 REINFORCEMENT

A. Place, support and secure reinforcement against displacement. Reinforce concrete structures or paving where and as shown on the plans.

B. The Contractor shall provide the Engineer a certificate from the reinforcement supplier stating that the steel complies with the requirements of ASTM A 615/ A 615M, ASTM A 185A/A 185M, or ASTM A 82 / A 82M as applicable.

C. All cover over reinforcement shall be located within a tolerance of -0-inches to +1/2-inch.

3.05 MIXING, TRANSPORTING AND PLACEMENT

A. Batch and mix concrete per ASTM C-94, at an established plant.

B. Equipment having components made of aluminum or magnesium alloys that would have contact with plastic concrete during mixing, transporting, or pumping of portland cement concrete shall not be used.

C. In no case shall concrete be used which has been retained in truck mixers for more than 90 minutes or before 250 revolutions of the drum or blades, whichever occurs first, after the introduction of mixing water to the batch.

D. Before placing concrete, the forms and steel reinforcement shall be approved for position, stability, and cleanliness. Concrete placement shall not commence until the Engineer's and DSOD inspection and approval has been obtained. All concrete shall be placed in the presence of the Engineer. No water may be added without Engineer’s approval.

E. Concrete shall be placed by methods that will prevent segregation and loss of ingredients, as to provide a dense and homogeneous mass, free from voids or rock pockets, and conforming to the lines and grades shown on the Project Plans. The concrete shall be deposited as nearly as possible in its final position.

F. Concrete shall not be dropped freely where reinforcing bars will cause segregation, not shall it be dropped more than four feet. Spouts, elephant

trunks, or other approved means shall be used to prevent segregation as necessary.

G. All concrete shall be thoroughly compacted into place by use of approved immersion-type vibrators, supplemented by hand spading, rodding, and tamping, as necessary. The duration of vibration shall be limited to the minimum required to produce satisfactory consolidation without causing segregation. Vibrators shall not be used to promote horizontal movement of concrete within the forms.

1. Vibrators shall be tested prior to concrete placement and adequate backups shall be on-site.

3.06 COLD AND HOT WEATHER REQUIREMENTS

A. Do not place concrete during sub or near freezing weather, snow, rain, or sleet unless protection from moisture and/or cold is provided.

B. Allowable Concrete Temperatures

1. Cold Weather
   a. When depositing concrete at near freezing temperatures, the concrete shall have a temperature of at least 50 degrees Fahrenheit but not more than 90 degrees Fahrenheit.
   b. The concrete shall be protected from freezing and maintained at a temperature of at least 50 degrees Fahrenheit for not less than seven days after placing.
   c. The use of salts or chemicals either as protection or as an admixture will not be permitted.
   d. During near freezing weather an air temperature log shall be kept by the Contractor for the first 7 days after placement. Intervals shall not exceed 2 hours.

2. Hot Weather
   a. Concrete shall be below 85 degrees Fahrenheit when placed. Do not place concrete in hot/windy weather without review of procedures by the Engineer.
   b. Generally erect sun shades and/or wind breakers to protect flat work during finishing and immediate curing operations.
   c. Do not place concrete for flatwork when the air temperature exceeds 90 degrees Fahrenheit.

3.07 EMBED ITEMS

A. The Contractor shall insure that all electrical conduit, pull boxes, pipes, reinforcing, anchors, etc., are firmly and securely fastened in place in true alignment prior to pouring concrete.

B. Embedded items shall be free of oil and other foreign matter, such as loose

coatings of rust, paint, and scale.

C. The Contractor shall notify the Engineer a minimum of 24 hours prior to commencement of concrete operations.

D. No concrete shall be poured until Engineer has inspected formwork to verify that all items to be embedded are in place.

E. Place concrete continuously between predetermined construction and/or control joints. Do not break or interrupt successive pours such that cold joints occur.

3.08 CONCRETE CURING

A. Slabs, footings, and other concrete shall be kept continuously wet for 48 hours, after placement, and shall be kept damp for 7 days after placement. Slab shall have cur/sealer applied immediately after finishing if other finishes are not affected. Cure shall be of a type that will not be detrimental to sealers to be applied later.

B. Concrete shall be cured in accordance with the water method or the forms-in-place methods as applicable.

C. Concrete shall obtain a minimum compressive strength of 2,500 psi prior to the removal of any falsework or formwork.

3.09 TREATMENT OF SURFACE DEFECTS

A. As soon as forms are removed, all exposed surfaces shall be carefully examined, and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface.

B. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the Engineer.

C. Minor defects shall be repaired with gunite or with cement mortar placed by an approved compressed air mortar gun.

D. Concrete containing major voids, holes, honeycombing, or similar depression defects shall be completely removed and replaced.

E. In no case will extensive patching of honeycombed concrete be permitted.

F. All repairs and replacements herein specified shall be executed by the Contractor at his own expense.

G. Defective surfaces to be removed and repaired shall be cut back from the final surface a minimum depth of 1/2-inch over the entire area. Feathered edges shall be avoided.

H. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, and not less than 1/32-inch depth of the surface film from all hard portions by means of an efficient sandblast.

I. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting so that while the repair material is being applied, the surfaces under repair will remain moist but not so wet as to overcome the suction upon which a good bond depends.

J. The material used for repair purposes shall consist of a mixture of one sack of cement to three cubic feet of sand.

K. For exposed walls, the cement shall contain such a proportion of Atlas White Portland cement as is required to make the color of the patch match the color of the surrounding concrete.

L. Holes left by tie-rod cones shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with dry packed mortar.

M. Holes left by form-tying devices having a rectangular cross-section and other imperfections having a depth greater than their least surface dimension shall not be reamed but shall be repaired with drypack-mortar.

N. All repairs shall be built up and shaped in such a manner that the completed work will not disturb the bond, cause sagging or horizontal fractures.

O. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

3.10 SCREW ANCHORS AND ANCHOR BOLTS

A. Screw anchors shall be of adequate size and length for their intended use. Concrete shall be allowed to cure a minimum of fourteen (14) days prior to any drilling for concrete anchors.

B. Screw anchors shall develop the following minimum strength when installed in cured (3,000 psi) concrete:

Diameter	Pullout Strength	Shear Strength
1/4"	2000 lbs	1000 lbs
3/8"	4000 lbs	3000 lbs
1/2"	6000 lbs	4200 lbs
5/8"	8000 lbs	6500 lbs
3/4"	9000 lbs	10,000 lbs

C. Anchor bolts shall be set and tied to reinforcing steel or formwork prior to pouring concrete. All anchor bolts shall be checked for alignment immediately after pouring concrete. All anchor bolts shall be of adequate size and length for their intended use.

D. All screws, anchors, and anchor bolts shall be 316 stainless steel unless otherwise indicated.

E. The length of all bolts and anchors shall be such that after joints are made up, the bolt protrudes through the nut one-eighth inch (1/8") to one-half inch (1/2") or as indicated on the Project Plans. All excess length shall be cut with a hacksaw and ground accordingly.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes

1. Bolts and Nuts
2. Miscellaneous Plates, Shapes and Bars
3. Welding
4. Galvanizing

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals

B. Section 03 30 00 – Concrete and Reinforcement

C. Section 05 51 00 – Metal Railings and Gratings

1.03 REFERENCES

A. American Society for Testing and materials (ASTM):

1. A 36 - Specification for Structural Steel
2. A 123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, Forged Steel Shapes, Plates, Bars and Strips
3. A 153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
4. A 307 - Standard Specification for Carbon Steel Bolts and Studs
5. A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

B. American Welding Society: Code of Welding in Building Construction

C. ANSI/ASME

1. ASME Section IX - Welding and Brazing Qualifications

1.04 SUBMITTALS

A. Welding Procedure Specifications for all proposed welding processes.

B. Welder Qualification Records for all welders to be engaged in the Work.

C. Shop Drawings of all Pre-fabricated materials

PART 2 PRODUCTS

2.01 GENERAL

A. Metals shall be free from defects that would impair strength, durability or appearance and shall be of the best commercial quality for the purpose specified.

B. All exposed supports, clips, braces, hangars, bolts, washer nuts, rods and bars shall be of the same material, color and finish as the metal to which applied, unless otherwise shown.

C. Metals shall be made with structural properties to sustain safely or withstand strains and stresses to which normally subjected, true to detail, clean, straight, with sharply defined profiles, curved work to true radii and unless otherwise noted, possess a smooth surface finish.

2.02 BOLTS AND NUTS

A. Bolts and nuts shall be of adequate size and length for their intended use.

B. All bolts for miscellaneous metal work shall be standard, hexagon head, machine bolts with cold pressed nuts and locking washers or cut washers per ASTM A307 galvanized per ASTM 153 for galvanized components.

C. The length of all bolts shall be such that after joints are made up, the bolt protrudes through the nut one-eighth (1/8) to one-half (1/2) inch. Cutting off excess thread length will not be permitted unless the bolt is manufactured of stainless steel.

D. All non-locking nuts and bolts shall have locking liquid applied that requires a 5 ft-lb torque to loosen.

2.03 MISCELLANEOUS SHAPES, PLATES AND BARS

A. All metal shapes plates and bars shall be made from ASTM A 36 “Specification for Structural Steel” steel or as specified elsewhere in the specifications or Project Plans.

B. All miscellaneous stainless steel metal shapes, plates and bars shall be made from ASTM Type A316 stainless steel or as specified elsewhere in the specifications or Project Plans.

C. The Contractor shall provide and install all miscellaneous shapes, plates, and bars including connections complete as shown on the Project Plans and as specified herein.

D. The Contractor shall fabricate from metal shapes, provide holes for proper installation, and set accurately in place all miscellaneous metal work, complete as shown on the Project Plans and as specified herein.

E. The Contractor shall furnish and install additional miscellaneous braces, clips, connections etc., as may be required to provide a stable, rigid installation.

PART 3 EXECUTION

3.01 FABRICATION

A. The work shall be fitted and shop assembled, ready for erection.

B. Steel shapes and all miscellaneous metal work shall be provided with holes, connection points and set accurately in place.

C. Additional supports, braces, clips, connectors, fasteners, etc. shall be installed as required to provide a rigid and stable installation.

D. Shop and field connections shall be bolted or welded, as required.

E. Jointing and intersection of metals shall be accurately made, tightly fitted, and made in true planes, with adequate fasteners.

3.02 WELDING

A. Welding and welding equipment shall conform to the requirements of the American Welding Society's Code of Welding in Building Construction.

B. Fabricators and welders shall be licensed operators with American Welding Society certification. Welding shall conform to the best modern practices.

C. General

1. All welds shall be of adequate strength and durability, with jointing made tight, flush, in true planes with base metals and shall be clean and ground smooth.

2. All field welding of steel shall be done by an unvarying arc welding process which excludes the atmosphere during the process of deposition and while the metal is in a molten state. The type and size of electrodes used, and the current and voltage required shall in all cases be of common acceptable practice. Reused or otherwise damaged electrodes shall not be used and violation of this provision shall be sufficient cause for rejection of the work. All welds shall be of uniform composition, neat, smooth, full strength, and ductile; shall be free from undercut, porosity and clinker; and shall be made with a technique which will insure uniform distribution of load throughout the welded section with a minimum tendency to produce eccentric stress or distortion of the weld or in the metal adjacent thereto. Welding shall be continuous along the entire line of contact.

3. Misalignment of pipe joints shall not be acceptable. Sharp projections or sheared edges of cut metal shall be ground smooth before welding.
4. All welds shall be free from pin holes, icicles, nonmetallic inclusions, air pockets, undercutting and/or any other defects. Completed welds shall have a reinforcing of not less than 1/32-inch, or more than 1/16-inch excess of the wall thickness of the pipe, around the entire perimeter of the weld, and the width of the finish or cover bed shall be no more than 1/8-inch greater than the original groove. Additional beads, or portions thereof as necessary, shall be added where the Engineer deems necessary due to lack of reinforcement, pin holes or other defects. All welds shall be capable of developing 100 percent (100%) of the tensile strength of the pipe steel. All slag and scale shall be removed from each bead, for visual inspection, immediately after each bead is run. The minimum size of all fillet welds shall be 1/4-inch.
5. Before welding, all pipe and bevels shall be cleaned to a bright metal.
6. Partial root beads, made when using external clamps, shall be uniformly spaced about the circumference of the pipe, and shall have an accumulative length of not less than twenty-five percent (25%) of the pipe circumference, before the clamps are removed.
7. No two (2) beads shall be started at the same location.
8. The number of beads required shall be governed by the wall thickness of the pipe so that the completed weld will have the reinforcement previously specified. Each weld shall consist of at least three (3) beads or passes.
9. Should laminations or split ends be discovered in the pipe during the process of welding, the full joint containing such defect shall be removed from the line and shall not be used in the construction of the line.
10. If ends of the pipe are damaged to the extent that satisfactory welding contact cannot be obtained, pipe shall be cut and beveled with approved beveling machine. The cost of all beveling shall be borne by the Contractor.
11. Whenever welds are cut out, leaving the two (2) ends of the pipe so that they cannot be properly spaced without damaging the line, they shall be joined by welding in a piece of pipe not less than 1-1/2 times the pipe diameter in length.
12. Cut-outs for branch connections shall be made using accurate templates. Gaps between pipe components shall not exceed 1/4 inch.
13. No welding of the pipelines, other than that shown on the plans, will be permitted. No temporary tack welding or welding of fit-up and erection brackets will be allowed.
14. Contractor shall submit to the Engineer for approval a minimum of two weeks before welding, detailed written procedures including process, electrodes, material and all other pertinent information.

15. Field welding of galvanized shall be done only after approval of the Engineer.

16. Field welding of stainless steel shall comply with Section 05 50 00 3.02.D, as well as this section.

3.03 GALVANIZING

A. Ferrous metal fabrications as indicated in plans, including supports, clips, braces, hangars, bolts, washers, nuts of all types, shall be hot dip galvanized after fabrication in accordance with ASTM A 123 “Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, Forged Steel Shapes, Plates, Bars and Strips” and ASTM A 153 “Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.”

B. Field-welded galvanized steel shall be field painted with zinc-rich primer meeting the requirements of ASTM A 780, as follows:

1. Clean all exposed metal to bright finish per paint manufacturer’s recommendation.

2. Immediately apply a thinned coat of primer. Exposed metal left un-coated more than four hours shall be re-cleaned.

3. After first coat of primer has dried, and per manufacturer’s recommendations, apply un-thinned coat of zinc primer.

END OF SECTION

SECTION 05 51 00

METAL RAILINGS AND GRATING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing all labor, materials, equipment, tools and incidentals and performing all operations necessary to construct fixed industrial safety railing, toe plates, and grating providing safe access on the discharge structure.

1.02 RELATED SECTIONS

A. Section 03 30 00 – Concrete and Reinforcement

B. Section 05 50 00 – Metal Fabrications

1.03 REFERENCES

A. Aluminum Association

B. American Society for Testing and Materials (ASTM)

1. ASTM A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
2. ASTM A123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

C. National Association of Architectural Metal Manufacturers (NAAMM)

1. Pipe Railing Manual, Including Round Tube
2. Metal Bar Grating Manual

D. State of California, Department of Industrial Relations (Cal/OSHA)

1. Standard 3212
2. Standard 3209

E. California Building Code, 2007 (CBC)

1.04 SUBMITTALS

A. Design criteria, structural calculations and shop drawings shall be submitted by the Contractor for the handrails.

B. Shop drawings and structural calculations shall be stamped and signed by a California Licensed Structural Engineer.

1.05 GUIDELINES

A. Handrails and toe plates shall be compliant with the applicable sections of Cal/OSHA and the 2016 California Building Code.

PART 2 PRODUCTS

2.01 HANDRAILS

A. Handrails shall be made of seamlessly welded standard steel pipe, architectural handrail conforming to ASTM A53, Type S, Grade A of the diameter and size indicated on the Project Plans. All metal handrails shall be galvanized per Section 05 50 00 – Metal Fabrications.

B. Railing shall be shop assembled in lengths not to exceed 24 feet for field erection.

C. Handrails shall be designed to withstand a 200-pound concentrated load applied in any direction at any point on the top rail. Handrails shall also be designed to withstand a load of 50 pounds per foot applied horizontally to the top rail. The 200-pound load will not be applied simultaneously with the 50 pounds per foot load. In addition, the handrails shall be designed to withstand a load of 100 pounds per foot applied vertically downward to the top rail and simultaneously with the 50 pounds per foot horizontal load. The 100 pounds per foot vertical load does not apply to stair rails.

D. The manufacturer shall submit calculations to the engineer for approval. Testing of base castings or base extrusions by an independent lab or manufacturer's lab will be an acceptable substitute for calculations. Calculations will be required for approval of all other design aspects.

E. Post spacing shall be a maximum of 6'-0". Posts and railings shall be a minimum of 1½-inch diameter Schedule 40 galvanized steel pipe. The handrail manufacturer shall show that their posts are of adequate strength to meet the loading requirements. If the manufacturer's posts are not of adequate strength, the manufacturer may reduce the post spacing or add reinforcing dowels or may do both in order to meet the loading requirements.

F. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations. The top surface of the top railing shall be smooth and shall not be interrupted by projected fittings.

G. The mid-rail at a corner return shall be able to withstand a 200-pound load without loosening. The manufacturer is to determine this dimension for their system. Provide physical tests from a laboratory to confirm compliance.

H. Toe plate shall conform to Cal/OSHA standards. Toe plate shall be a minimum of 4 inches high and shall be an extrusion that attaches to the posts

with clamps which will allow for expansion and contraction between posts. Toe plates shall be set ¼ inch above the walking surface. Toe plates shall be provided on handrails as required by Cal/OSHA and/or as shown on Project Plans. Toe plates shall be shipped loose in stock lengths with pre-manufactured corners for field installation.

I. Finish shall be galvanized per Section 05 50 00 – Metal Fabrications.

2.02 GRATING

A. Grating shall be aluminum grating, GLA-200 smooth, welded fabrication, with swaged cross bars spaced on 4-inch centers. Bearing bars shall be spaced on 1-3/16-inch centers. Top surface of bearing bars shall be striated to provide a nonslip surface.

B. Grating shall be capable of safely supporting 400 pounds per square foot with a maximum deflection of not more than ¼ inch under a uniform load of 100 pounds per square foot. The maximum fiber stress shall not exceed that which is allowed by the Aluminum Association.

C. Minimum depth shall be 2 inches.

D. Standard installation clearances and tolerances shall conform to the requirements of the current Metal Bar Grating Manual published by the National Association of Architectural Metal Manufacturers.

E. Grating shall be supplied with aluminum frames embedded in concrete which incorporate a recess under the horizontal bearing leg to receive hold down fasteners. A minimum of four fasteners is required per panel unless otherwise noted on the Project Plans. Clips shall not protrude above the top of the grating.

F. Cutouts for circular obstructions shall be at least 2 inches larger in diameter than the obstruction. Cutouts 4 inches and less in diameter shall be made in the field. All openings where more than four bearing bars are cut shall be banded with bar the same depth as the bearing bars. The ends of all grating and planking panels shall be banded.

G. Grating shall be secured in place to prevent accidental removal or displacement.

PART 3 EXECUTION

3.01 FABRICATION

A. Handrail shall be the product of a company normally engaged in the manufacture of pipe railing, and shall meet the quality requirements of NAAMM's Pipe Railing Manual.

B. Steel welded handrail connections shall be made in accordance with Section 05 50 00 – Metal Fabrications. Welding shall be performed in the shop unless otherwise indicated. Welded joints of handrails shall be ground and dressed smooth to match adjacent surfaces and so that the shape and profile of the item welded is maintained.

C. Metal handrails shall be prefabricated in the factory as far as practical.

D. All grating components shall be factory fabricated and fitted prior to shipment to ensure that all components are ready for assembly and placement in the field without modification.

E. Paint all aluminum surfaces in contact with concrete or dissimilar metals with a shop coat of bituminous paint.

END OF SECTION

SECTION 26 05 00

COMMON WORK FOR ELECTRICAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall install, ready for use, the electrical system as specified herein and shown on the Contract drawings. This document describes the function and operation of the system and particular components, but does not necessarily describe all necessary devices. All components and devices shall be furnished and installed as necessary to provide a complete operable and reliable system for accomplishing the functions and meeting the performance set forth hereinafter.

B. Furnish all required labor, materials, project equipment, tools, construction equipment, safety equipment, transportation, test equipment, incidentals and services to provide a complete and operational electrical and control system as shown on the Contract E-& I- series Drawings, included in these Specifications, or necessary for fully operating facility. See Appendix “B” for “Device Index” for this project.

C. Examine the specification and Drawings for mechanical equipment and provide all starters, circuit breakers, switches, pushbuttons and appurtenances which are not specified to be with the mechanical equipment. Erect all electrical equipment not definitely stated to be erected by others, furnish and install conduit, wire and cable and make connections required to place all equipment in complete operation.

D. It is recommended that the Electrical Contractor attend the job walk for the site and shall have accomplished the following:

1. Thoroughly examine existing conditions before submitting his bid proposal to perform any work. He/she shall compare site conditions with data given on the plans or in these Specifications. No allowance shall be made for any additional costs incurred by the Contractor due to his/her failure to have examined the site or to have failed to report any discrepancies to the City prior to bid.
2. It is the Contractor’s responsibility to be fully familiar with the existing utility locations, conditions and local requirements and regulations.
3. Verify all measurements and conditions and shall be responsible for the correctness of same. No extra compensation will be allowed because of differences between Work shown on the Drawings and measurements at the site.

E. Any major deviations in location and conduit routing that the Contractor makes without the express written review or direction of the Engineer, shall be considered to have been made at the Contractor's sole responsibility.

1. Such deviations made by the Contractor shall be reflected on the Contractor supplied "Record Drawings."
2. The City will reimburse the Engineer and the City will then deduct an amount equal to said reimbursement from the Contractor's contract for all engineering, drafting, and clerical expenses associated with updating the Record Drawings due to any major unauthorized changes.

F. The major areas in the scope of work shown on E & I-series Contract drawings, Device Index located in Appendix "B", which includes both the furnishing and installation are:

1. Modifying existing Power Panel P to feed new Pedestal.
2. Pedestal.
3. Instrumentation and other miscellaneous devices. This includes all wiring and cables.
4. Programmable Logic Controller (PLC) hardware for controlling the valves, and other miscellaneous devices.
5. Programming Programmable Logic Controller (PLC), Operator Interface (OI) and SCADA will be by others.
6. Installation of primary devices, equipment and instruments are not completely detailed on Contract Drawing plan sheets. Use Device Indexes and Contract Drawings installation details for installation and mounting requirements.
7. All necessary miscellaneous shut off, sample, manifold and calibration valves to sensors.
8. Conduits and the field interconnection wiring between panels, panelboards, controls, lighting, receptacles, and equipment provided under all other Sections, etc.
9. Provide all necessary hardware, fittings, and devices to connect the designated equipment and wiring.
10. Trenching, backfilling, and compaction for all underground conduit routes, concrete pads, and pull boxes.
11. Grounding system and equipment grounding.
12. Concrete pads and supports for electrical and instrumentation equipment.
13. Remove and dispose of all excess dirt, paving, concrete, and other materials from site work.

G. Existing site is limited in space. It is the Contractor's responsibility to provide an electrical and instrumentation package to fit in the allocated space.

H. Contractor shall coordinate with the Engineer prior to cutover of any system.

I. The following specifications incorporate specific equipment and devices that are standards of the City because of their serviceability, because of the local availability of labor, parts and materials, or because of the ability of the City to umbrella the equipment under existing maintenance contracts.

J. All electrical work shall conform with the National Electric Code (NEC) 2017 issue. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to these codes and standards.

K. All panels, panelboards, panelboard transformers, etc. shall be supplied by one system supplier. This includes, but not limited to, all work necessary to select, furnish, supervise installation, calibrate, program, and place into operation all transmitters, instruments, controllers, alarm equipment, monitoring equipment, and accessories as specified herein. The system supplier shall not subcontract any portions of the equipment provisioning with the exception of fire and security alarm systems without written approval of Engineer.

1.02 CODES AND STANDARDS

A. All electrical/instrumentation equipment and materials, including installation and testing, shall conform to the following applicable codes and standards:

1. ANSI — American National Standards Institute, Inc.
2. EIA — Electronics Industries Association.
3. ETL — Electrical Testing Laboratories.
4. FM — Factory Mutual.
5. GO128 — General Order No. 128, Rules for Construction of Underground Electrical Supply and Communication Systems, Public Utilities Commission of the State of California.
6. IEEE — Institute of Electrical and Electronics Engineers.
7. ICEA — Insulated Power Cable Engineers' Association.
8. ISA — International Society of Automation (ISA) Standards (formerly Instrument Society of America.
9. NEC — National Electrical Code, 2017 Edition.
10. NEMA — National Electrical Manufacturers Association.
11. NETA — Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, International Electrical Testing Association.
12. NESC — National Electrical Safety Code.
13. NFPA — National Fire Protection Agency & NFPA820

14. OSHA Occupational Safety and Health Act Standards.

15. UL Underwriter's Laboratories, Inc.

B. The revisions of these codes and standards in effect on the date of issuance of the Contract Documents shall apply.

C. Codes and standards referenced shall be considered minimum acceptable work.

D. In instances where two or more codes are at variance, the most restrictive requirements shall apply.

E. Nothing on the Drawings or in the Specifications shall be construed to permit work or materials not conforming to the preceding codes and standards.

F. All work shall also be performed in accordance with the City, State, County, and local Utility codes.

G. The Contractor shall furnish without extra charge any additional material and labor which may be required for compliance with these codes and standards, even though the work is not explicitly mentioned in the Specifications or shown on the Contract E- Series Drawings.

H. Amperage listed on the single-line Drawings for motors are per NEC Table 430.250 and may not necessarily match that of the equipment supplied. It is the electrical system supplier and Contractor’s responsibility to furnish equipment sized for the motors supplied for this project at no additional cost.

1.03 RELATED WORK IN OTHER SECTIONS

A. Provide an electrical system that interfaces to work performed under other Mechanical and Equipment Sections of these Specifications. I

B. The following is part of Division 26:

1. Section 26 05 73 – Power System Studies

1.04 CONTRACTOR QUALIFICATIONS

A. It is the intent of this Section that the complete responsibility for management and installation of the electrical and instrumentation required for this project be by the Contractor. This responsibility includes, but is not limited to, supervision and coordination of work performed by the System Supplier.

B. Uncertified electricians shall not perform electrical work for which certification is required per Labor Code Section 3099. Electricians shall be required to carry proof of certification on their person at all times. Electricians found on the jobsite without proof of certification will be asked to leave, prohibited from

working on-site until proof of certification has been provided and may be reported to the Contractors State License Board (CSLB).

C. The Electrical Contractor shall meet the following minimum qualifications:

1. Has a current C-10 Contractor's License.
2. Has regularly engaged in similar electrical construction for the municipal water and wastewater industry.
3. Has performed work of similar or greater complexity on at least five previous projects.
4. Has all persons performing work as electricians certified as either a General Electrician or registered Apprentice by the California Apprenticeship Council per California Labor Code Section 3099.
5. Has been actively engaged in the type of electrical and instrumentation work specified in this Section for a minimum of three years.

1.05 SYSTEM SUPPLIER QUALIFICATIONS

A. General:

1. All switchboard, panels, MCCs, and PLC hardware shall be supplied by one System Supplier. This includes, but not limited to, all work necessary to select, furnish, supervise installation, calibrate, program, and place into operation all transmitters, instruments, controllers, alarm equipment, monitoring equipment, and accessories as specified herein. The System Supplier shall not subcontract any portions of the equipment provisioning with the exception of fire and security alarm systems without written approval of Engineer.
2. The System Supplier shall have an on-staff project engineer with prior experience on similar sized projects. This project engineer shall coordinate the technical aspects of this project and prepare the submittals and drawings. This project engineer's name, address, and phone number shall be provided within the first week after notice to proceed. The System Supplier project engineer shall attend all coordination meetings and be on-site when requested by the Engineer.

B. System Suppliers

1. The System Supplier shall meet the following minimum qualifications:
   a. Has regularly engaged in similar instrumentation systems for the Municipal Water and Wastewater industry.
   b. Has successfully performed work of similar or greater complexity on at least five previous projects under one company name which is the present company name.
   c. Has staff on this project that has successfully completed the ISA Certified Control Systems Technician (CCST) program. System Supplier shall provide proof of certification on demand.

d. Has a permanent, fully staffed, and equipped service facility in operation at least six (6) months prior to bid date within 150 miles of project site. Service facility shall be under same company name as System Supplier and same company.
e. System Supplier facility shall be staffed with personnel and equipment required to maintain, repair and calibrate the instrumentation system. Subletting warranty to third party is not acceptable.

2. Pre-Qualified System Suppliers:
   a. It is the intent of the City to secure the highest quality of work for this project. The System Suppliers listed below have been determined to meet minimum qualifications specified in this Section and are pre-qualified by the City for providing bids as System Suppliers on the project.
      1) Tesco Controls, Inc. (phone 916 395-8800)
      2) Primex (phone 707 449-0341)
3. System Suppliers not pre-qualified by the City shall submit the information listed herein at least 14 calendar days prior to bid date, and if approved by the City, will be listed in a Contract addendum prior to bid.
   a. Company history.
   b. List of five (5) completed projects of similar size and nature.
      1) Provide completion dates of projects.
      2) References of Owner Representative in charge of project, including contact name and telephone number.
   c. List of projects in progress.
      1) Description of scope of projects.
      2) Dollar amount of projects.
   d. Complete 2018 Year End Financial statement prepared by a Certified Accountant or complete 2018 Company Tax Returns listing assets and liabilities.
4. Additional information for clarification as requested by the City in writing shall be provided by the System Supplier asking for the qualification or qualification will automatically be denied.
5. System Supplier providing financial statements lacking detail or stating that detailed financial records are proprietary will be disqualified as a qualified System Supplier and is grounds alone for disqualification.
6. Any qualification package deemed incomplete or lacking sufficient information to determine qualification will result in System Supplier not being qualified.
7. No reason will be released on why a System Supplier was not qualified.

1.06 CONTRACT DOCUMENTS

A. The Contract drawings and specifications are intended to be descriptive of the type of electrical system to be provided; any error or omissions of detail in either shall not relieve the Contractor from the obligations there-under to install in correct detail any and all materials necessary for a complete operational system, at no additional cost.

B. The Contract drawings are generally diagrammatic; exact locations of electrical products shall be verified in the field with the Engineer. Except where special details on drawings are used to illustrate the method of installation of a particular piece or type of equipment or materials, the requirements or descriptions in this Section shall take precedence in the event of conflict.

C. The Contract Electrical elementary, elevation and one-line diagrams are the basis of the electrical system to be provided and are for reference only. It is the Contractor's responsibility to adjust and make minor revisions to the diagrams as necessary for operational system at no additional cost to the City. Additional isolators, relays, wiring, terminal blocks, and appurtenances, shall be provided for an operation system at no additional cost to the City.

D. Location at facilities of equipment, inserts, anchors, panels, pull boxes, conduits, stub-ups, and fittings for the electrical system are to be determined by the Contractor and Engineer at time of installation. Contractor shall make minor adjustments to locations of electrical equipment required by conditions and coordination with other trades at no additional cost.

E. The Conduit and Wire Routing Schedule, wire fill, and number of conduits are based on the best information available. It is the Contractor's responsibility to modify the conduit schedule based upon Shop Drawings for the actual equipment. Such modifications in conduit sizes and numbers of conductors shall be at no additional cost to the City, if such changes are the direct result of the equipment selected by the Contractor. A copy of the Conduit Schedule and Electrical plans showing conduit routing shall be updated weekly by the Contractor. Progress payments will be withheld if during monthly checks it is found that the Contractor fails to maintain the Conduit Schedule updates.

F. Electrical & instrumentation, conduit & wire lengths shown on Contract Drawings are approximate. The Contractor is responsible for determining actual lengths for bidding and installation purposes.

G. The Contractor shall examine the architectural, mechanical, structural and electrical and instrumentation equipment provided under other Sections of this Contract in order to determine the exact routing and final terminations for all conduits and cables. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences,

and the physical location of wire terminations on equipment. Conduits shall be stubbed up as near as possible to equipment.

H. All equipment shall be installed and located so that it can be readily accessed for operation and maintenance. The Engineer reserves the right to require minor changes in location of equipment, without incurring any additional costs.

I. Provide means to furnish equipment and accessories, do the installation, complete connections, submit documentation, perform start-up, and be responsible for the warranty.

J. Where conduits are shown as "home runs" on the Contract drawings or stated to be furnished, but not explicitly shown, as part of the scope of work; the Contractor shall provide all fittings, boxes, wiring, etc. as required for completion of the raceway system in compliance with the NEC and the applicable specifications in this Section.

K. No changes from the Contract drawings or specifications shall be made without written approval of the Engineer. Should there be a need to deviate from the Contract documents, submit written details and reasons for all changes to the Engineer for favorable review.

L. When existing conduits are to be used, it is the Electrical Contractor’s responsibility to verify conduit size and routing. This includes all potholing or other location methods. Existing conductors and conduits damaged by Contractor during construction shall be repaired or replaced at no cost to City.

M. The resolution of conflicting interpretation of the Contract documents shall be as determined by the Engineer.

N. The Contractor shall coordinate with other Suppliers on the project for a complete and operable system.

O. It is the System Supplier's responsibility for obtaining and instrumentation transmitter configuration software, manuals and disks necessary for the Contractor to program and configure the instrumentation transmitters.

P. The Electrical Contractor shall maintain a separate set of neatly and accurately marked set of Record Documents, consisting of spreadsheets, specifications and full size blue-line Electrical (E-Series) and Instrumentation (I-Series) Contract Drawings.

    1. These documents are to be used specifically for recording the as built locations and layout of all electrical and instrumentation equipment, routing of raceways, junction and pull boxes, and other diagram or document changes.

2. These Record documents shall be kept up-to-date during the progress of the job, with all "change orders", submittal modifications, and construction changes shown and stamped with “As-Built” at end of job.
3. These Record documents shall not be used for daily construction use and shall not contain any mark-ups that are unrelated to as-built corrections.
4. The following lists the record documents shall be as-built by Electrical Contractor:
    a. E-Series Drawings.
    b. Panelboard schedules.
    c. Conduit and Wire Routing Schedule.
        1) A copy of the Conduit and Wire Routing Schedule and Electrical plans showing conduit routing shall be updated weekly by the Contractor. Progress payments will be withheld if during monthly checks it is found that the Contractor fails to maintain the Conduit Schedule updates.
    d. Lighting Schedule.
    e. Duct banks and their routing with offset measurement and indicate changes in depth.
5. The following lists the record documents that shall be as-built by System Supplier to be maintained by Electrical Contractor:
    a. I-Series Drawings
    b. Instrumentation Index.
6. Record documents shall be kept current weekly with all "change orders", submittal modifications, and construction changes shown. Record Documents shall be subject to the inspection by the Engineer at all times, progress payments or portions thereof may be withheld if Record Documents are not accurate or current.
7. When documents are changed, they shall be marked with erasable colored pencils using the following coloring scheme:
    a. Additions - red
    b. Deletions - green
    c. Comments - blue
    d. Dimensions - black
8. Show the following on the Electrical (E-Series) Record Contract Drawings by dimension from readily obtained base lines:
    a. Exact location, type and function of electrical and instrumentation equipment and devices.
    b. Precise routing and locations of underground conduits, pullboxes, junction boxes, and appurtenances that make-up the raceway system.
    c. Show the dimensions, location and routing of electrical work, which will become permanently concealed.

d. Show complete routing and sizing of any significant revisions to the systems shown.

9. Prior to acceptance of the work, the Contractor shall deliver to the Engineer one set of record full size drawings neatly marked accurately showing the information required above.

1.07 COORDINATION

A. The Contractor shall coordinate the electrical work with the other trades, code authorities, utilities, and the Engineer; with due regard to their work, towards promotion of a rapid completion of the project. If any cooperative work must be altered due to lack of proper supervision of such, or failure to make proper provisions, then the Contractor shall bear expense of such changes as necessary to be made in work of others.

B. Manufacturer's directions and instructions shall be followed in all cases where such is not shown on the Contract Drawings or herein specified.

C. The Contractor shall coordinate with the City, witnessing Engineer and System Supplier to test the entire system.

D. The Contractor shall schedule a minimum of two (2) mandatory coordination meetings during the initial and submittal phase of the project. The meetings shall be held at the jobsite and include, as a minimum, attendance by the Engineer, Prime Contractor, Contractor, System Supplier Engineer, and Design Engineer.

1. The first meeting shall be held in advance of the first comprehensive submittal and no later than 21 days after Contract award. The purpose of the meeting shall be for the Contractor and System Supplier to summarize their understanding of the project, discuss any proposed substitutions or alternatives, review the project schedule, explain format of Drawings, and discuss any other topics deemed necessary for project coordination.

2. The second meeting shall be held after the review of the first comprehensive System Supplier submittal has been completed by the Engineer. The purpose of the meeting is to discuss comments made on the submittal package, to update the project schedule, and coordinate the testing, training, and installation phases of the project.

E. The electrical and instrumentation modifications and additions are to be made at the operational site. The Contractor shall schedule all the required work with the Engineer. Each shutdown shall be implemented to minimize disruption of the existing operations. The work to be provided under this Contract shall not disrupt any of the existing operations without prior approval.

1. The Contractor shall limit all scheduled shutdown periods to less than 1/2 hour (30 minutes) and only with prior approval of the Engineer. There shall be no unscheduled shutdown periods.

2. Carry out scheduled shut downs only after the time, date, and sequence of work proposed to be accomplished during shutdown has been favorably reviewed by the Engineer. Submit shutdown plans at least three weeks in advance of when the scheduled shutdown is to occur.
3. Contractor shall make provisions for portable generators and automatic transfer switches when areas of the pump station will be without power.
4. The Engineer reserves the right to delay, change, or modify any shutdown at any time, at no additional cost to the City, when the risk of such a shutdown would jeopardize the operation of system or effluent regulations.
5. Contractor is advised that during adding circuit breakers, demolition of existing conduits, installation of new conduits, etc., Contractor is responsible to keep equipment running for all necessary pump station operation. The Contractor shall install temporary generators, motor controls, panelboards, power panelboards, wiring, etc. to keep all station equipment powered and automatic controls functional.
6. Electrical Contractor shall be on site during all shutdown, changeout of equipment periods,

F. Schedule within 20 days after award of Contract all service installations and connections with utilities. Delays due to lack of effort by the Contractor which delay the project completion for lack of utility services will not be considered valid and Contract liquidated damages will be assessed.

G. The Contractor shall cease work at any particular point, temporarily, and transfer his operations to such portions of work as directed, when in the judgment of the City it is necessary to do so.

H. Prior to commencing construction, the Electrical Contractor shall arrange a conference with the Prime Contractor, System Supplier, the Engineer, as well as all equipment and system suppliers vital to the current phase of work. During the meeting, the equipment and system suppliers shall verify types, sizes, locations, installation requirements, controls and diagrams of all equipment furnished. The equipment and system suppliers shall, in writing, inform the Engineer that all phases of coordination of this equipment have been covered and if there are any unusual conditions, they shall be enumerated at this time. Contractor shall be made aware that demolition and modifications to existing facility shall be made in stages requiring close coordination between General Contractor, Electrician, System Supplier and City.

1.08 SUPERVISION

A. The Contractor shall schedule all activities, manage all technical aspects of the project, coordinate submittals and drawings, and attend all project meetings associated with this Section.

B. The Contractor shall supervise all work in this Section, including the electrical system general construction work, from the beginning to completion and final acceptance.

C. The Contractor shall supervise and coordinate all work in this Section to insure each phase of the project, submittal, delivery, installation, and acceptance testing, etc. is completed within the allowable scheduled time frames.

D. The Contractor shall be responsible for obtaining, preparing, completing, and furnishing all paper work for this Section; which shall include transmittals, submittals, forms, documents, manuals, instructions, and procedures.

1.09 INSPECTIONS

A. All work or materials covered by the Contract documents shall be subject to inspection at any and all times by the City and Engineer. If any material does not conform to the Contract documents or does not have a favorably reviewed submittal status; then the Contractor shall, within three days after being notified by the City, remove said material from the premises; and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.

B. The Contractor shall give the Engineer 10 working days' notice of the dates and time for inspection. Date of inspection shall be as agreed upon by both the Contractor and Engineer.

C. Work shall not be closed in or covered over before inspection and approval by the Engineer. All costs associated with uncovering and making repairs where non-inspected work has been performed shall be borne by the Contractor.

D. The Contractor shall cooperate with the Engineer and provide assistance at all times for the inspection of the electrical system under this Contract. The Contractor shall remove covers, provide access, operate equipment, and perform other reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality and adequacy of the work.

E. Before request for final inspection is made, the Contractor shall submit to the City in writing, a statement that the Contractor has made his own thorough inspection of the entire project enumerating punch list items not complete and that the installation and testing is complete and in conformance with the requirements of this Section.

F. The City may arrange for a facility inspection by Cal-OSHA Consultation Service at any time. The Contractor shall make the necessary corrections to bring all work in conformance with Cal-OSHA requirements, all at no additional cost to the City.

G. Contractor will be Responsible for any Additional Cost for Overtime, Weekend Overtime or Differential Time, Expenses for Inspection of Defective Work that has to be re-inspected.

1.10 JOB CONDITIONS

A. The Contractor shall make all arrangements and pay the costs thereof for temporary services if required during construction of the project, such as temporary electrical power and telephone service. Upon completion of the project, remove all temporary services, equipment, material and wiring from the site as the property of the Contractor.

B. The Contractor shall provide adequate protection for all equipment and materials during shipment, storage and construction. Equipment and materials shall be completely covered with two layers of plastic and set on cribbing six inches above grade so that they are protected from weather, wind, dust, water, or construction operations. Equipment shall not be stored outdoors without the approval of the Engineer. Where equipment is stored or installed in moist areas, such as unheated buildings, etc., provide an acceptable means to prevent moisture damage, such as a uniformly distributed heat source to prevent condensation.

C. The elevation of the project sites are shown on Contract Civil Drawings. All equipment shall be de-rated, as recommended by the Manufacturer or in accordance with ANSI C37.30.

D. The normal outdoor, not in direct sunlight, ambient temperature range of the job site will vary between 0 to 120 degrees Fahrenheit. All equipment shall be rated to operate in these temperature ranges or provisions for adequate heating and cooling shall be installed, at no additional cost to City.

E. Contractor & Subcontractors shall utilize temporary services (if provided) during construction of the project. No Contractors shall utilize City power, receptacles, etc. during construction.

1.11 SUBMITTAL AND DRAWING REQUIREMENTS

A. One hardcopy of each electrical submittal shall be submitted for favorable review by the Engineer per this subsection and as specified herein. They shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.

B. A copy of the appropriate Specification Sections, with addendum updates included, and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (√) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore, requested by the Contractor, each deviation shall be underlined and denoted

by a unique number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the Specifications. The submittal shall be accompanied by a detailed, written justification for each numbered item explaining variance or non-compliance with specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no review.

C. The electrical submittals shall include, but not be limited to, data sheets and drawings for each product together with the technical bulletin or brochure. The electrical submittals shall include:

1. Product (item) name used herein and on the Contract Drawings.
2. The manufacturer's model or other designation.
3. Tag name/number per the drawing, schedules, and indexes.
4. Index Binder Tab Dividers on hardcopy.
5. Detail electrical one line, elementary and loop diagrams and interconnection diagrams showing all wiring requirements for each system. General sales literature will not be acceptable. The part or model number with options to be provided shall be clearly identified. Where more than one item or catalog number appears on a catalog cut, the specific item(s) or catalog numbers(s) proposed shall be clearly identified.
6. Complete documentation with full description of operation.
7. Complete catalog cuts with full description of equipment. General sales literature will not be acceptable. The part or model number with options to be provided shall be clearly identified. Where more than one item or catalog number appears on a catalog cut, the specific item(s) or catalog numbers(s) proposed shall be clearly identified.
8. Location of assembly at which it is installed.
9. Input-output characteristics.
10. Range, size, and graduations as required.
11. Physical size with dimensions and mounting details.
12. Enclosure fabrication and color.
13. Enclosure layout and elevation drawings to scale.
14. Quantity and quality requirements for electric power, air, and/or water supply.
15. Materials of construction of components.
16. Nameplate schedule.
17. Interconnect Diagram.

18. Failure to provide submittals with heavy duty permanent plastic labeled index tabs may be grounds for immediate rejection without review.

19. Bill of Materials: A complete Bill of Materials list shall be provided at the inside of the front cover.
    a. The Contractor shall provide Bill of Material for electrical components formatted as shown in Appendix "A" of this section.
    b. The System Supplier shall submit a separate set of Bill Materials for the MCC, spare parts and another listing all field equipment.
    c. Generic names or part numbers used by a distributor or Systems House are not acceptable; originating manufacturer's name and part number shall be listed.

20. A separate instrument data sheet shall be provided for each instrument per ISA S20 standards or approved equal. Data sheets shall be printed on blue or pink paper. Provide an index with proper identification and cross-referencing of each data sheet.

21. Submit CD disk copies of all submitted drawing in AutoCAD format.

22. For each resubmittal, provide a copy of submittal comments and a separate letter, on Company letterhead, identifying how each submittal comment has been addressed in the resubmittal.

23. Electronic PDF version of submittals shall be provided with table of contents regardless of hard copy format of submittal. PDF shall be "bookmarked" at each index, subtab, transmittal letter, copy of appropriate check marked Specification Section, bill of materials, copy of submittal comments (for resubmittals), Contractor's response to submittal comments (for resubmittals), drawings, etc. Where no tabs were provided, Contractor shall provide bookmarks for each item submitted. Bookmarks shall be descriptive of actual document, tab, etc. Failure to bookmark PDF or broken bookmarks may be grounds for immediate rejection without review. Bookmarks shall not be out of order; the English description shall match that listed in the Submittal's Table of Contents.

24. Catalog cuts shall be submitted grouped together by material and not scattered throughout the submittal intermingled with other material cut sheets (i.e. do not submit cut sheet for specific size conduit followed by cut sheet for specific size wire, and then cut sheet for different size conduit and different size wire. Group conduits together, group wires together, etc.)

D. All Drawings shall be drawn using AutoCAD, drawn in a professional manner and submitted on 11" x 17" sheets. Shop Drawings shall be provided with minimum drafting details, as illustrated on the Contract "electrical" series drawings. Diagrams shall carry a uniform and coordinated set of wire colors, wire numbers, and terminal block numbers. The shop Drawings shall include:

1. Electrical one-line diagrams detailing all devices associated with the power distribution system. The following applicable information or data shall be shown on the one-line diagram: location, size and amperage rating of bus;

size and amperage rating of wire or cable; breaker ratings, number of poles, and frame sizes; generator receptacle; manual transfer switch, utility metering, voltage, amperage, number of wires and phases; fault interrupt ratings; ground size and connections; neutral size and connections; power fail and other protective devices; fuse size and type; distribution transformer; panelboard; starters; contactor size and overload range; motor full load amperage of submitted motor and horsepower; rating for miscellaneous loads; etc. Submit a list for each piece of equipment containing the motor voltage, phase and full load amps with one-lines for verification of accuracy of submitted one line drawings.

2. Elementary diagrams shall be provided for all relay logic, power supplies, PLC I/O and other wiring. All elementary diagrams shall be drawn in JIC EMP/EGP format and standards similar to those shown on the E-series elementary diagrams showing ladder rung numbers and coil & contact cross referencing numbers.

3. Analog and digital I/O loop diagrams shall be provided showing the wiring requirements for each instrument loop. Graphic symbols shall conform with ISA S5.4 drawing standards. A loop diagram shall be furnished for each analog and digital I/O process and all PLC I/O cards. Loop diagrams shall include the following as a minimum:
   a. The loop diagram shall be drawn with sufficient detail to express control philosophy. The diagram shall show all components and accessories of the instrument loop, highlighting special safety and other requirements. These diagrams shall be arranged to emphasize device elements and their functions as an aid to understanding the operation of a system and for maintaining or troubleshooting that system.
   b. A separate drawing shall be prepared for each analog and digital card. Each card shall be arranged on the diagram in the same order as the physical arrangement of the card terminations. All termination points on the diagram shall be shown with the actual equipment identification, device and relay terminal number or letter, and I/O point P&ID English descriptor and tag name. A separate drawing shall be prepared for each card.
   c. Energy sources - electrical power, air supply, pneumatic and hydraulic fluid supply, designating voltage, current, pressure, etc. shall be shown in detail on the diagram. Input and output signals (e.g., 1-5 VDC, 4-20 mA DC, 3-15 psig, etc.), power and instrument supplies to devices (e.g. 120 VAC, 24 VDC, 80 psig, etc.) shall be shown.
   d. Engineering units shall be shown on the diagram. Each wire label, equipment identification terminal number or letter and color code shall be shown. Signal and DC polarities shall be shown.
   e. All spare wires, cables and termination points shall be shown. All jumpers, grounding, shielding, power supply details shall be shown.

4. Enclosure and Elevation layout diagrams for MCC/Electrical Panels/Pedestal; show all front panels, sidepan and backpan devices

drawn to scale. Show fabrication methods and details; including material of construction, paint color, support & latching mechanisms, fans & ventilation system, and conduit entrance areas.

5. Interconnection Diagram - An interconnection diagram shall be furnished for each electrical and instrumentation system. Each interconnection diagram shall include the following as a minimum:
   a. Interconnect drawings shall be prepared for all equipment by the System Supplier.
   b. The diagrams shall be utilized by the electrician during all phases of installation and connection of all conductors to ensure coordination of equipment interconnect.
   c. The diagrams shall show wiring as field labeled at the end of the project when as-builts are submitted.
   d. Each wire labeling code as actually installed shall be shown. The wiring labeling code for each end of the same wire must be identical.
   e. All device and equipment labeling codes shall be shown.
   f. Interconnections shall be shown point to point with identified lines. Diagrams of the wireless or wire schedule type are not acceptable. Bundled wires shall be shown as a single line with the direction of entry/exit of individual wires clearly shown. Interconnect diagrams shall not be combined with loop or elementary diagrams.
   g. All terminations points on the diagram shall be shown with the actual equipment identification terminal number or letter. This identification of terminations includes terminal blocks, junction boxes, all devices, computer I/O points, etc.
   h. Diagrams shall include raceway numbers, raceway size, cable numbers, wire color code, and wire numbers.
   i. Each wire and cable size and color code shall be shown. Each conduit route with the conduit label and conduit size shall be shown. Wire and cable routing through conduits, wireways, manholes, handholes, junction boxes, terminal boxes and other electrical enclosures shall be shown with the appropriate equipment labels. All spare wires, cable, and termination points shall be shown. Cable shields shall be shown.
   j. Labeling codes for terminal blocks, terminals, wires, cables, panels, cabinets, instruments, devices, and equipment shall be shown.
   k. Schematic symbols shall be used for field devices, showing electrical contacts. Signal and DC circuit polarities shall be shown.
   l. The diagrams shall show all other Contract and supplier drawing numbers, for reference, that are associated with each device that is interconnected.
   m. Attached to each interconnect, a copy of all the support documents used in preparing interconnects shall be submitted. This includes current issues of panel schematics, elementary diagrams, panelboard schedules, conduit schedules, one-line diagrams, connection diagrams,

terminal block diagrams, submittals, contract drawings, vendor drawings and all other data used to develop the interconnection diagram as noted in the “Reference Documents” corner of interconnect drawings.

n. Interconnects shall include list of all applicable reference drawings, request for clarifications, field instructions and change orders. All deletions and additions of equipment, conduits, wire, and cables shall be clearly shown. Clearly state why termination data is not available. Statements should point to applicable area and be placed in a bold box.

o. Field wiring shall not start before the interconnection drawings have been submitted by the Contractor and approved by the Engineer.

p. Do not show the same wires or jumpers on the elementary or loop and interconnection diagrams. All jumper, shielding and grounding termination details not shown on the connection diagrams shall be shown on the interconnection diagrams.

q. Interconnection diagrams shall be submitted and approved by the Engineer for each electrical and instrumentation system. The Contractor shall not pull in any wires into conduits that do not have approved interconnects. If the Contractor pulls in wire without Engineer approval of associated interconnect drawings, the Contractor will not be reimbursed for labor for re-pulling in wires even if there was an error in wire fill or sizing. Also, if the Contractor pulls in wire without Engineer approval of associated interconnect drawings, then all progress payments for that particular area of work will be withheld until approved interconnect drawings are in use.

r. All interconnection diagrams shall be prepared by a System Supplier under the supervision of or by a State of California Registered Electrical Engineer and shall bear that Engineer’s professional stamp and signature for all Interconnection Drawings submitted for approval including as-builts and those used in the field installation. Engineer’s stamp missing from interconnection drawings will be sufficient grounds to reject entire interconnection drawing submittal without review. All deletions and additions of equipment, wire, and cables shall be clearly shown. Interconnects shall include list of all applicable reference Drawings, request for clarifications, field instructions, and change orders. Failure to provide backup references or signed and stamped drawings may be grounds for immediate rejection.

s. Example format of Interconnection diagram is shown on Contract “E” Series Drawings or may be obtained from the Engineer.

t. Interconnection Drawings shall use bundled wire format as shown on example interconnect Contract Drawing. Interconnect drawings submitted with wiring of a single conduit run separated onto multiple interconnect drawings will be rejected without review. A single conduit run with wiring shown on separate interconnect drawings will be allowed only after written approval is given by the Engineer for each conduit run prior to submitting the associated interconnect drawings.

u. Only field wiring between switchboards, MCCs, Panelboards, Control Panels, and other electrical and instrumentation devices or equipment shall be shown on interconnection drawings. No internal panel wiring shall be shown on interconnect drawings except jumper or other wiring to be installed in field by Electrical Contractor.

v. Interconnect Drawings along with the corresponding support documents shall be submitted in a separate submittal package. Interconnect drawings submitted with non-interconnect drawing packages will be rejected. The latest support documents shall be obtained by system supplier from Contractor for all instruments, panels, and equipment, and included with interconnect drawing submittal. Support documents shall have their submittal number marked in upper right hand corner.

w. Provide a notes section on each interconnect drawing. In the note section, provide a detailed list of any variances from the Contract conduit schedule necessary for completing the interconnections (i.e. wire fill changes, conduit additions, etc.). Change orders regarding wire fill, conduit schedule and errors in plans regarding conduits and wires may not be processed until interconnect drawings have been received for such work.

x. The field electrician shall mark-up all interconnection diagrams during installation to show accurate as-built wiring, conduits runs, terminations, etc. If interconnection drawings are not properly as-built, the Electrical Contractor will have cost deducted from the Contract for the Engineer to field verify and prepare as-built interconnection drawings amount. The amount of the deduction shall be determined on a time and material basis. The cost of such work shall be $120.00 per hour plus expenses.

y. The system supplier shall be responsible to collect all information necessary to complete each interconnection drawing. This includes making field trips to collect all terminal connection data for new and existing, panels, switchboards, panelboards, instruments, equipment and electrical panels.

z. An index of drawings shall be provided with each Interconnection submittal listing the unique drawing number and the description of the interconnect drawing (e.g. Drawing 4321-IC1004 Pump 1004 Interconnect Drawing).

aa. Provide conduit and interconnect drawing cross reference indexes. Interconnect Conduit Index shall list all conduits listed in the Conduit & Wire Routing schedule and its associated Interconnection Drawing number. An Interconnection Drawing Index shall list all Interconnection drawings and the conduits shown on that specific drawing. These two indexes shall be at the front of all interconnection drawing submittals.

bb. Interconnection submittals that contain more than two motor control panels/centers shall have heavy duty dividers with permanent plastic labeled index tabs separating each group of drawings.

6. Submit full size drawing of all nameplates and tags, as specified herein, to be used on project. The Engineer has the right to adjust nameplate engraving titles during submittals at no additional cost to the City. Submittal to include the following:
    a. Dimensions of nameplate.
    b. Exact lettering and font for each nameplate.
    c. Color of nameplate.
    d. Color of lettering.
    e. Materials of construction.
    f. Method and materials for attachment.
    g. Drawing showing location of nameplate on each panel.

E. The hardcopy submittal shall be bound in a three-ring binder, which is sized such that when all material is inserted the binder is not over 3/4 full. Binder construction shall allow easy removal of any page without complete manual disassembly; spiral ring type binders are not acceptable.

1. The binder shall be appropriately labeled on the outside spine & front cover with the project name, contract number, equipment supplier's name, specification section(s), and major material contained therein.
2. An index shall be provided at the inside of the front cover. This index shall itemize the contents of each tab and sub tab section. Also list the project name, contract number and equipment supplier's name, address, phone number, and contact person on the index page. Index dividers (tabs) shall be provided to separate each section.
3. All copies shall be clear and legible. Data sheets shall be provided for each instrument, with an index and proper identification and cross-referencing.
4. Catalog cuts and drawings shall be submitted for all devices and components in the electrical system.
5. Field equipment shop documents, panel equipment shop documents, drawings, and bill of materials shall be grouped under separate tabs. Catalog cuts shall be ordered in the same sequence as their corresponding Contract specification subsection.
6. Failure to provide submittals with heavy duty permanent plastic labeled index tabs may be grounds for immediate rejection without review.
7. Drawings shall be submitted in a separate hole-punched binder that covers the entire 11” X 17” length of the Drawing.

F. Exceptions to the Contract Specifications or Drawings shall be clearly defined by the Equipment Supplier.

1. Data shall contain sufficient details so a proper evaluation may be made by the Engineer. Contractor shall provide separate letter (located in the front of the submittal) detailing specific exceptions to the Contract Specifications or Drawings.

2. Exceptions that are noted in the marked-up Drawings or Specifications, but not listed on the Exceptions/Clarifications letter, will be considered as non-responsive and not accepted as changes to the Contract Documents

G. The Supplier shall coordinate submittals with the work so that project will not be delayed. This coordination shall include scheduling the different categories of submittals, so that one will not be delayed for lack of coordination with another.

H. No submittal documents shall be labeled as proprietary. Labeling documents as proprietary will be sufficient cause for rejection of entire submittal. The City reserves the right to copy or duplicate any and all portions of the documents provided for the project including copyrighted documents as desired.

I. No material or equipment shall be allowed at the job site until the submittal for such items has been favorably reviewed by the Engineer and marked “No Exceptions Taken” or “Make Corrections Noted”.

J. The equipment specifications have prepared on the basis of the equipment first named in the Specifications. The Supplier shall note that the second named equipment, if given, is considered acceptable and equal equipment, but in some cases additional design, options, or modifications may be required, at no additional cost, to meet Specifications.

K. The decision of the Engineer governs what is acceptable as a substitution. If the Engineer considers it necessary, tests to determine equality of the proposed substitution shall be made, at the Supplier's expense, by an unbiased laboratory satisfactory to the Engineer.

L. Electrical submittals shall be complete giving all details of connections, wiring, instruments, enclosures, materials and dimensions. Standard sales literature will not be acceptable.

M. Request for information (RFIs) shall not be included in submittals. RFI’s shall be submitted separately in its individual submittal number.

N. Resubmittals shall be provided with a copy of the previous submittal comments and a separate letter, on company letterhead, identifying how each submittal comment has been addressed in the resubmittal.

PART 2 PRODUCTS

2.01 QUALITY

A. It is the intent of the Contract specifications and drawings to secure the highest quality in all materials and equipment in order to facilitate operation and maintenance of the facility. All equipment and materials shall be new and

the products of reputable suppliers having adequate experience in the manufacture of these particular items. For uniformity, only one manufacturer will be accepted for each type of product.

B. All equipment shall be designed for the service intended and shall be of rugged construction, of ample strength for all stresses which may occur during fabrication, transportation, erection, and continuous or intermittent operation. All equipment shall be adequately stayed and braced and anchored and shall be installed in a neat and workmanlike manner. Appearance and safety, as well as utility, shall be given consideration in the design of details. All components and devices installed shall be standard items of industrial grade, unless otherwise noted, and shall be of sturdy and durable construction suitable for long, trouble free service. Light duty, fragile and competitive grade devices of doubtful durability shall not be used.

C. Products that are specified by manufacturer, trade name or catalog number established a standard of quality and do not prohibit the use of equal products of other manufacturers when a listing “or approved equal” is given provided they are favorably reviewed by the Engineer prior to installation.

D. Underwriters Laboratories (UL) listing is required for all substituted equipment when such a listing is available for the first named equipment.

E. When required by the Contract specifications or requested by the Engineer, the Contractor shall submit equipment or material samples for test or evaluation. The samples shall be furnished with information as to their source and prepared in such quantities and sizes as may be required for proper examination and tests, with all freight and charges prepaid. All samples shall be submitted before shipment of the equipment or material to the job site and in ample time to permit the making of proper tests, analyses, examinations, rejections, and resubmissions before incorporated into the work.

F. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting or operator interaction when power is restored.

G. Signal transmission from remote or field electric and electronic devices shall be 4-20 mA, sourced by a 24 VDC loop supply from the panel that is to receive the signal. Nonstandard transmission methods such as impulse duration, pulse rate, and voltage regulated will not be permitted except where specifically noted.

H. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission.

I. It is the System Supplier’s responsibility to visit jobsite to collect and document existing conditions and equipment device part numbers in order for all similar called out new equipment to match existing.

2.02 NAMEPLATES & TAGS

A. Equipment exterior nameplates - Nameplate material shall be rigid laminated black phenolic with beveled edges and white lettering; except for caution, warning, and danger nameplates the color shall be red with white lettering. The size of the nameplate shall be as shown on the drawings. No letters are allowed smaller than 3/16". All phenolic nameplates located outdoors shall be UV resistant. Securely fasten nameplates in place using two stainless steel screws if the nameplate is not an integral part of the device. Epoxy cement or glued on nameplates will not be acceptable. Engrave the nameplates with the inscriptions as approved by the Engineer in the submittal.

1. For each major piece of electrical equipment provide a manufacturer's nameplate showing the Contract specified name and number designation, the manufacturer's name, model designation, part number, serial number, and pertinent ratings such as voltage, amperage, # of phases, range, U.L listing, etc.
2. For each device with a specific identity (pushbutton, indicator, instrument, etc.) mounted on the exterior or deadfront of a piece of equipment provide a nameplate with the inscription as shown in the Contract documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device.
3. For all receptacles and switches, provide a faceplate engraved or stamped with the panelboard and circuit number it is fed from. Also, include on faceplate or on a separate nameplate for each light switch identification use such as “OUTSIDE BUILDING LIGHTS”, “PERIMETER LIGHTS”, “MCC ROOM”, etc.
4. All field instruments and devices shall be labeled with designation shown on P&ID diagrams.
5. All transformers and panelboards shall have nameplates with ½" high letters and be engraved with designations as shown on one-line Drawings.
6. All safety and disconnect switches shall have nameplates with ½” high letters and be engraved with designations as shown on one-line drawings
7. Underground Pull Box and Vault Cover Identification: Engrave or bead weld pull box covers with minimum 1/4” thickness and 1/2” letters and Covers shall be engraved with designations as shown on Contract drawings or as directed by the Engineer.
8. Aboveground Pull Box Cover Identification: 316 stainless steel screws attached stamped 316 stainless steel plate nameplates with 1/2” letters and

be engraved with designations as shown on Contract drawings or as directed by the Engineer.

B. Equipment Interior Nameplates - Nameplate material shall be clear plastic with black machine printed lettering as produced by a KROY or similar machine; except caution, warning, and danger nameplates shall have red lettering. The size of the nameplate tape shall be no smaller than 2" in height with 3/8" lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on a clean surface using the adhesion of the tape. Add additional clear glue to hold the nameplate securely in place when necessary. Nameplates shall not be attached to wireways or gutters. For each device with a specific identity (relay, module, power supply, fuse, terminal block, etc.) mounted in the interior of a piece of equipment provide a nameplate with the inscription as shown in the Contract documents. Where no inscription is indicated in the Contract documents, furnish nameplates with an appropriate inscription providing the name and number of device used on the submittal drawings. Stamp the nameplates with the inscriptions as approved by the Engineer in the submittal. Nameplates shall not be attached to wireway covers or to removable devices.

C. Equipment Tags - When there is no space or it is impractical to attach an engraved phenolic nameplate with screws, as is the case with most field devices and instruments, the Contractor shall attach a tag to the equipment with the same inscriptions as specified above in paragraph A. The tag shall be made from stainless steel material and the size of the nameplate shall be no smaller than 3/8"h x 2"w with 3/16" machine printed or engraved lettering unless otherwise approved by the Engineer. The tag shall be attached to the equipment with stainless steel wire of the type normally used for this purpose. SST wire shall be crimp connected. Twisting ends together is not acceptable.

D. Engrave or machine-print the tags with inscriptions as approved by the Engineer in the nameplate submittal.

E. Provide temporary labels for all instruments and devices immediately when installed. Temporary labels shall be provided with 1/2" letters minimum and labeled with P&ID tag number.

2.03 COMPONENTS

A. FUSES

1. Fuses used in circuits 200 VAC and above shall be time- delay type FNQ or approved equal, 13/32" x 1-1/2", and have an interrupting rating of 10,000 AIC at 500 VAC. Fuse holders shall be of the barrier type and rated 600 VAC.

2. Fuses used in 120 VAC shall be time-delay type MDL or approved equal, 1/4" x 1-1/4", and have a rating of 250 VAC. Fuse-holders shall be of the terminal block type.

3. Fuses used in signal and 24 VDC circuits shall be fast acting type ABC or approved equal, 1/4" x 1-1/4", and have a rating of 250 VAC. Fuse-holders shall be of the terminal block type.
4. Fuses shall be sized in conformance with the NEC.

B. CIRCUIT BREAKERS

1. Circuit breakers shall be of the indicating type, providing ON, OFF and TRIPPED positions of the operating handle. Circuit breakers shall be quick-make, quick-break, with a thermal-magnetic (TM) action, except when protecting motor feeders where motor circuit protector (MCP) breakers with adjustable magnetic trip shall be used. Circuit breakers shall be the bolted on type. The use of tandem or dual circuit breakers in a normal single-pole space to provide the number of poles or spaces specified are not acceptable. All multiple-pole circuit breakers shall be designed so that an overload on one pole automatically causes all poles to open. Circuit breakers and motor circuit protectors shall be manufactured by Eaton, G.E., ITE, or approved equal.
2. Each 480 volt or 240V circuit breaker shall have a minimum interrupting capacity of 42,000 amperes. Each 120 volt breaker shall be rated for a minimum 10,000 amperes interrupting capacity. Breakers shall be sized as shown on Drawings and as necessary for the supplied equipment.
3. Fused disconnects shall not be used in place of breakers.

C. TERMINAL BLOCKS

1. CONTROL PANEL TERMINAL BLOCKS
   a. Terminal blocks to be clamp type, 6mm spacing, 600 volt, minimum rating of 30 amps, and mounted on DIN rail, Entrelec M4/6 colored. DIN rail shall be same type as used for the relays. Install an extra DIN rail on each type of terminal strip with 4 terminals for future additions.
   b. Provide terminal blocks with "follower" plates which compress the wires and have wire guide tangs for ease of maintenance. Terminal blocks which compress the wires with direct screw compression are unacceptable. All power, control and instrument wires entering and leaving a compartment shall terminate on terminal blocks with wire numbers on terminals and on both ends of the wires.
   c. Terminal Tags and Markers: Each terminal strip shall have a unique identifying alphanumeric code at one end (i.e.: TB1, TB2, etc.) and plastic marking strip running the entire length with a unique number for each terminal. On each terminal strip, terminal numbers shall be assigned starting with #1 at one end, incrementing in alphanumerical order (i.e.: 1, 2, 3, 4…). Numbers shall be assigned to all blocks except grounding blocks. Fuse blocks shall be assigned unique tag numbers such as FU1, FU2. No two fuses shall be assigned the same tag number.

d. Plastic marking tabs shall be provided to label each terminal block. These marking tabs shall have a unique number/letter for each terminal which is identical to the "elementary" and "loop" diagram wire designation. Numbers on these marking strips shall be machine printed and 1/8 inch high minimum.

e. Terminal blocks shall be physically separated into groups by the level of signal and voltage served. Power and control wiring above 100 volts shall have a separate group of terminal blocks from terminal blocks for wiring below 100 volts, intermixing of these two types of wiring on the same group of terminal blocks is not allowed.

f. Provide a ground terminal or connection point for each grounding conductor.

g. Provide a separate common or neutral terminal for every two (maximum) inputs and/or outputs.

2.04 CONTROL PANEL

A. Control Panel shall consist of a separate enclosure, panel light, PLC system, power supply, Ethernet switch, full height backpan and other devices for a complete and operational system. Provide the Siemens Family PLC to match City Standard.

1. One (1) Controller Module with i-device compatibility: Siemens 6ES7211-1BE40-0XB0. Built-in 8 discrete inputs (24VDC), 6 discrete outputs (2A relay) and 2 analog inputs (voltage).

2. One (1) Discrete Input/Output card: 8 DI (24VDC)/ 8DO (2A Relay) Siemens 6ES7223-PH32-0XB0.

3. One (1) Analog Input/Output card: 4AI (4-20mA or 0-10V)/2AO (4-20mA or 0-10V), Siemens 6ES7234-4HE32-0XB0.

4. Operator interface:

   a. Provide PLC Operator Interface (OI) Siemens 6AV213-2GB03-0AX0 system, to match City standard. OI to be panel mounted through cutout in Pedestal deadfront door. Provide an operator interface with the following:

      1) OI programming development software.
      2) Associated cables.
      3) Color Touchscreen, with eight (8) function keys.
      4) Communicate with PLC over Ethernet link.
      5) 7-inch diagonal terminal.
      6) 24VDC

B. All wiring from the PLC I/O terminals shall be wired to interface terminal blocks, including all spares, as shown on Contract drawings.

1. Provide all cables necessary for a complete and operable system.

C. Miscellaneous Devices

1. Lights, switches, pushbuttons, terminal blocks etc. to match those specified herein.
2. RFI filters to be for power line radio frequency protection, CORCOM VK series or approved equal.
3. Receptacle to be duplex and rated 20 amps, 120 VAC, 2 pole, 3 wire grounding, NEMA 5-20R configuration, specification grade, and side wired to screw terminals.
4. DC power supply to be linear type and rated per Contract drawings at 24VDC, Sola, Idec, Power One, or approved equal.
5. RFI filter for radio interference protection shall be Corcom 15VK, or approved equal.
6. Ethernet Converter/Switches shall be provided for PLC system as shown on Contract Drawings. Ethernet switches shall be have 6 ports (unless otherwise noted), 10/100 Base T and ST connections. Fiber optic switches shall be N-Tron, Hirschmann, or approved equal.

2.05 FIELD DEVICES

A. MAGNETIC FLOWMETER

1. The magnetic flow meter shall consist of a flow tube FE and a converter FIT, complete with all necessary interconnecting cables and conduits. The magnetic flow meter shall be of the low frequency electromagnetic induction type and shall produce a DC pulse signal directly proportional and linear to the flow rate, with the duration not less than 50 milliseconds. The meter shall be suitable for bi-directional flow with full scale flow rates. Complete zero stability shall be an inherent characteristic of the metering system. Meters requiring field zero adjustment will not be acceptable. The meter accuracy shall not be affected by changes in fluid pressure, temperature, viscosity, or conductivity.
2. Flange connections shall be ANSI Class 300 as required by mechanical Drawings. Flanges shall be coordinated with Contractor installing piping.
3. Stainless steel grounding rings shall be provided at both ends of the flow tube when required by the manufacturer. The tube internal liner material shall be polyurethane, unless recommended otherwise by the manufacturer for the application and approved by the Engineer. Electrode material shall be 316 stainless steel and shall be flush type. The meter shall incorporate a high impedance amplifier of 100,000 Megohms or greater, eliminating the need for electrode cleaning systems.
4. The converter electronics shall be mounted remotely as shown on Contract P&ID Drawings. The converter shall be microprocessor controlled, utilizing digital signal processing with automatic zero correction to provide a linear 4-20 mA signal proportional to the forward flow rate specified. The

electronics shall provide totalized pulse output and positive zero return control. Rangeability shall be field adjustable over a 100 to 1 range. Field adjustable signal dampening shall be provided. Low flow cutoff shall be provided to eliminate flow transients when no flow is present in the pipe. A rate indicator and totalizer scaled in engineering units shall be provided and shall be viewable on a LCD display(s) through a clear window in the enclosure. The converter shall have self diagnostics which constantly check for proper operation. If a failure occurs, a fault indication shall be provided to notify the operator of a problem. The converter shall contain a self test mode to allow the operator to manually simulate the output 4-20 mA signal to any value between 0% and 100% to check out any driven devices in the loop. The converter shall be rated to operate in an ambient temperature range from -4°F to 131°F.

5. The converter electronics shall be designed for operation from a power source per Device Index, with a power consumption of less than 24 watts.
6. The flow element shall be sealed to provide full submergence rating.
7. When converter electronics are shown to be mounted remotely, additional special cabling without any splices (Cabling between flow element and remote mounted flow indicating transmitter), mounting hardware, and devices necessary to complete the installation shall be provided by the manufacturer at no additional cost to the City.
8. Electronics shall be provided in NEMA rated enclosures specified in Instrumentation and Device Index.
9. The meter shall be hydraulically calibrated at a facility located in the United States and the calibration shall be traceable to the National Bureau of Standards. A certified copy of the calibration test results shall be submitted to the Engineer prior to shipment of the meter.
10. The accuracy of the complete metering system including flow tube and converter electronics shall be 0.5% of rate over the range settings of 0.033 to 33 feet per second. Variations in temperature, voltage, and frequency within the ranges listed herein shall not affect the accuracy in excess of 0.5% of flow rate. The flowmeter shall be submergence proof per IP68. Conduits between flowmeter element and electronics shall be sealed to retain submergence rating per flowmeter manufacturer's requirements.
11. The flow meter shall be Rosemount 8750W, with remote signal converter/indicator unit, to match City Standard.

B. BUBBLER SYSTEM

1. A complete air system consisting of an air compressor assembly, controls, and associated hardware or approved equal. The air control system shall be of the pressure transmitter type which operates from the level back pressure of compressed air through air tubing from an air pipe connected to the existing system installed in the wet well.

2. The pressure transmitter shall incorporate a high-accuracy capacitance sensor. With this sensor, process pressure is transmitted through the isolating diaphragm and fill fluid to the sensing diaphragm in the center of the capacitance cell. Capacitor plates on both sides of the sensing diaphragm detect its position. The differential capacitance between the sensing diaphragm and the capacitor plates shall be directly proportional to process pressure. Pressure transmitter shall be provided with LCD of pressure value. The pressure transmitter shall be Rosemount to display or approved equal.
3. Each calibration valve assembly shall have integral stainless steel block and bleed valving. Valve shall have a non-rotating tip stem and a fully back-seated bonnet. Block and bleed valve shall be Hex HB59 (phone 800-543-7311) or approved equal.
4. Provide air flowmeter 0-5.2SCFH, with adjustable steel valve, tantalum float, stainless steel fittings and valve, latching inductive ring sensor King Instruments 7430 with inductive ring sensor or approved equal.
5. The air system shall utilize 1/4" diameter polyethylene tubing, Imperial Paraflex #44P-Black or an approved equal. All valves and fittings for tubing shall be brass, Eastman Poly-Flo, Swagelok or approved equal.
6. Air sensing tube to wet well shall be run in conduit as shown on plans. Reconnect sensing tube to existing connection in Dry Pit.
7. Wiring and piping of the air compressor assembly shall be so arranged that the unit is easily removed without removing any other equipment.
8. All miscellaneous pneumatic system accessories shall be furnished and installed by the Contractor to provide the operations specified herein and shown on the Drawings.

C. FLOAT SWITCH

1. The level switch shall utilize a Buna-N level with slosh shield that moves with liquid level to actuate a SPST (single pole, single throw) NC switch. The switch contact shall open with rising level. The level switch shall have a minimum electrical switch rating of 20 VA at 120 VAC. The level switch shall have an operating temperature range of -40° to +180°F. The level switch shall be suspended by PVC cable of sufficient length to reach bottom of the sump and have a weighted collar. The level switch shall be a Gems LS-750, or approved equal.

2.06 WIRE

A. This section applies to all wires or conductors used internal (non-field) for all electrical equipment or external for field wiring. Wire quantity and size shall be per “Conduit & Wire Routing Schedule”.

B. Material - Wire shall be new, plainly marked with UL label, gauge, voltage, type of insulation, and manufacturer's name. All wire shall conform to the following:

1. Conductors shall be copper, with a minimum of 98% conductivity.
2. Wire shall be Class B stranded.
3. Insulation of all conductors and cables shall be rated 600 volt.
4. Insulation type for conductors smaller than #6 AWG shall be moisture and heat resistant thermoplastic NEC Type THHN/THWN, rated 90 °C in dry locations and 75 °C in wet locations, or approved equal. Conductors #6 AWG and larger shall be XHHW insulation rated 90 °C in dry locations and 75 °C in wet locations.
5. Field wire minimum AWG sizes:
   a. #12 for wires used for individual conductor circuits 100 volts and above, except for Control Wire which may be #14AWG when listed in the Conduit and Wire Routing Schedule.
   b. #14 for wires used for individual conductor circuits below 100 volt.
6. Non-field or equipment wire minimum AWG sizes:
   a. #16 for wires used for individual conductor circuits 100 volt and above.
   b. #18 for wires used for individual conductor circuits below 100 volt.
7. Instrument wiring:
   a. Field: Instrument cables shall have 600V tray/UV rated cable rated insulation and 100% individual shielded twisted pair #16 AWG conductors with drain wire.
   b. Non-Field (inside enclosures): Instrument cables shall have 600V rated insulation and 100% individual shielded twisted pair #18 AWG conductors with drain wire.
   c. Single twisted shielded pair (T.S.PR.) cables shall be Belden or approved equal.
8. Special purpose wiring:
   a. Manufacturer Supplied Cables (MNFR CBL): Cables and wiring for special systems shall be provided by the manufacturer with the equipment and installed per the manufacturer's recommendations.
   b. CAT 6 Cable:
      1) CAT 6 communication cable in underground (UG) conduit shall meet the following requirements:
      2) TIA/EIA-568-B Category 6 Specifications.
      3) #24 AWG solid bare copper conductor, 4 or 25 pair shielded twisted pair per “Conduit & Wire Routing Schedule”.
      4) Rated for direct burial application.
      5) Insulation: Solid Polyolefin.
      6) Filling compound: 80°C extended thermoplastic rubber.

7) Outer Jacket: Black, water and UV resistant polyethylene.
8) 600V rated.
9) Electrically continuous aluminum shield.
10) Communication cable shall be Superior Essex or approved equal.

c. Indoor CAT 6 communication cable meet the following requirements:
1) TIA/EIA-568-B Category 6 specifications.
2) #24 AWG solid bare copper conductor, 4 twisted pairs.
3) Thermoplastic Dielectric type.
4) Shielded bulk cable.
5) PVC jacket.
6) UL listed.
7) 600V rated.
8) Non-plenum usage rated when routed in conduit.
9) Plenum usage rated when routed in plenum spaces.

d. PLC Fiber Cable
1) The PLC communication system shall use fiber optic cable to connect PLC to the existing Plant Network. All fiber optic cable shall be provided and connected under this Section. The fiber optic cable shall be multimode 62.5/125 micrometer diameter with six glass fibers, Kevlar strength member and PVC jacket material with OFNR UL rating. All active and spare fiber optic cables shall be terminated with spider fan-out kits and LC style connectors. Provide six spare connectors. Fiber optic cable shall be Superior Essex TeraGain multimode fiber or approved equal.
2) Fiber optic cable shall be tested for optical loss in accordance with Standard Fiber Optic Cable OTDR Test procedures and verified to have an optical loss below that required to perform optimum communications throughput. All new fiber optic cable shall be installed and terminated by Company specializing in the area.

C. Color Code - Color code of all wire shall conform with the following table.

WIRES COLOR CODE TABLE			
DESCRIPTION	**PHASE/CODE LETTER**	**FIELD WIRE** **WIRE OR TAPE COLOR**	**NON-FIELD WIRE** **COLOR**
480 V, 3 PHASE	A	BROWN	BROWN
	B	ORANGE	ORANGE
	C	YELLOW	YELLOW

WIRES COLOR CODE TABLE			
DESCRIPTION	**PHASE/CODE LETTER**	**FIELD WIRE WIRE OR TAPE COLOR**	**NON-FIELD WIRE COLOR**
240 V or 208 V, 3P	A	BLACK	-
	B	RED (ORANGE if high leg)	-
	C	BLUE	-
240 / 120 V, 1 P	L1	BLACK	BLACK
	L2		-
24V POSITIVE	24P	BLUE	BLUE
24V NEGATIVE	24N	BLUE	BLUE
AC CONTROL (Not Neutral)		VIOLET	RED (YELLOW FOR FOREIGN CIRCUITS)
PLC 110V INPUT (Not Neutral)		YELLOW	YELLOW
PLC 110V OUTPUT (Not Neutral)		ORANGE	ORANGE
AC CONTROL (Not Neutral)		VIOLET	RED (YELLOW FOR FOREIGN CIRCUITS)
DC CONTROL		BLUE	BLUE
NEUTRAL	N	WHITE	WHITE
GROUND	G	GREEN	GREEN
SHIELDED PAIR	+	WHITE	WHITE
	-	BLACK	BLACK

1. High leg of open delta shall be colored orange per NEC 110.15.
2. All wires #8 and below shall have wire insulation the color specified. Wires #6 and larger may be black with color tape.
3. No other colors shall be used without prior approval of the Engineer.
4. The same color shall be connected to the same phase throughout the panel.

5. All wires shall be properly fused or protected by a breaker at the amperage rating allowed by the NEC.
6. Neutral wires used for AC Control shall be White per NEC.

D. Wire identification - all wires, field and interior (non-field) to equipment, shall be identified with machine permanent ink printed sleeve markers. Hand lettered wire labels are not acceptable and shall be replaced at the Contractor's expense. All wires that are electrically the same (connected to common termination points) and do not pass through a contact or other switching device shall have the same wire identification. The wire labeling code for each end of the same wire shall be identical. Tubing shall be sized for the wire and shrunk into place with the properly sized heat gun. The wire identification code for field and panel wiring shall be the number/letter designated on the approved “elementary”, “loop” and “interconnection” diagrams.

2.07 CONDUIT, RACEWAYS, AND WIREWAYS

A. GENERAL - Conduit, raceways, and wireways, wiring methods, materials, installation shall meet all requirements of the NEC, be UL labeled for the application, and meet the minimum following specifications.

1. All wiring shall be installed in conduits, raceways, or wireways when interconnecting equipment and devices.
2. The Contractor shall use special conduit, raceways, wireways, construction methods, and materials as shown on the Contract drawings; which shall take precedence over any general methods and materials specified in this section.
3. The minimum size conduit shall be 3/4-inch unless indicated otherwise on the Drawings or for special connections to equipment.
4. Conduit stubs shall be capped with coupling, nipple, & cap and each end identified with conduit labels.
5. Conduit drains shall be installed with GRS-PVC condulets-T with Stainless Steel Universal Conduit Drain, Appleton ECDB38 or approved equal. Install in conduit locations where condensation may form.
6. Conduit Marking
   a. All conduits listed in the “Conduit and Wire Routing Schedule” shall have conduit tags at both terminations of each conduit.
   b. Conduit Tag - Tag material shall be 19 gauge brass or stainless steel tag with engraved lettering. The size of the tag shall be 2” diameter. No letters are allowed smaller than 7/16”. Securely fasten tags in place using 316 stainless steel 0.048 inch diameter wire of the type normally used for this purpose (catalog cut sheet shall be submitted). Stainless steel wire shall be crimp connected. Twisting ends together is not acceptable. Engrave the tags, on both sides, with the conduit number as

listed in the Conduit and Wire Routing Schedule on the Contract “E”-series Drawings. Labeling shall be neatly installed for visibility and shall be clearly legible. Conduit tags shall be Brady Valve Tags, or approved equal.

c. Install new conduit tags for reused conduits at all transition boxes and endpoints. Conduit & Wire Routing Schedule shall be updated as these modifications take place.

7. Warning Tapes:
   a. Bury detectable warning tapes approximately 12 inches above all underground conduit runs of two or more outside of building. Align parallel to and within 3 inches of the centerline of the conduit or duct bank.
   b. Plastic tape shall be colored for particular underground service, 3-inch minimum width, utilize tape made of material resistant to corrosive soil. Use red tape for “Electric” service and orange tape for “Communication” service. Use tape with printed wording listing type of service. Manufacturers and types: Seton, Blackburn, Griffolyn Co., Terra-Tape, Brady, or equivalent.

B. ALUMINUM RIGID CONDUIT – (ARC)

1. Provide ALUMINUM rigid steel factory ells for 90 degree transitions.
2. Provide threaded-type fittings, couplings, and connectors; set-screw type and compression-type are not acceptable.
3. All joints shall be treated with T & B type CP "Kopr-Shield", LPS No. 3 rust inhibitor, or approved equal.
4. All junction and metal pull boxes shall be aluminum.
5. Metal conduits entering enclosures shall be fitted with insulated grounding bushing; O-Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.

C. GALVANIZED ALUMINUM CONDUIT - PVC COATED (ARC-PVC)

1. Standard weight, aluminum conduit with a 40-mil thick polyvinylchloride coating bonded to both the outside and urethane interior coating. Conduit shall be hot-dip galvanized conforming to NEMA RN 1. ARC-PVC conduit to be Robroy Plasti-bond or approved equal.
2. Provide PVC coated galvanized rigid steel factory ells for 90 degree transitions.
3. Fittings shall be hot dipped aluminum with a PVC 40 mils thick coating. Provide threaded type fittings, couplings, and connectors; set screw type and compression type are not acceptable.
4. All junction and metal pull boxes shall be aluminum with exterior surfaces PVC coated to 40 mils thickness.

5. Conduits entering enclosures shall be fitted with insulated grounding bushing; O Z "HBLG", Appleton "GIB", or approved equal. All grounding bushings shall be tied to the grounding system with properly sized bonding conductors per the NEC code.
6. ARC-PVC conduits shall be used for underground conduits where listed in the “Conduit and Wire Routing Schedule”.
7. ARC conduit is allowed only when specifically called out in the “Conduit and Wire Routing Schedule”.

D. PVC CONDUIT, SCHEDULE 80 (PVC)

1. Shall be high impact schedule 80 polyvinylchloride suitable for use underground, direct burial and for use with 90 C wires, and shall conform to UL 651. Shall be UL listed and labeled for "direct" burial.
2. A copper bonding conductor shall be pulled in each raceway and bonded to equipment at each end with approved lugs.
3. Each underground run shall be placed in a trench with a five (5) inch sand bed evenly compacted on all sides, top and bottom.
4. Bends, elbows, sweeps and risers shall be made with PVC coated galvanized rigid steel (GRS-PVC) conduit using threaded adapters. Bond each metallic portion to each other and to equipment connected at each end of conduit run.
5. PVC fittings shall have solvent-weld-type conduit connections.
6. PVC conduit shall be stored on a flat surface and shielded from the sun.

E. LIQUID TIGHT FLEXIBLE METAL CONDUIT - (FLEX)

1. All flex conduits shall be metallic with water tight outer jackets.
2. Connectors:
   a. NEMA 1 or 12: Metallic with insulated bushings.
   b. Non-NEMA 1 or 12 Areas: PVC coated metallic with insulated bushings.
3. Final connections to vibrating equipment such as heaters and fans shall be made with flexible conduits.
4. Flexible conduit lengths shall not be greater than 24 inches.
5. Flexible metallic conduit shall not be considered as a ground conductor, install a separate wire for equipment bonding.
6. Flexible conduit shall only be installed in exposed or accessible locations.
7. Flex conduits shall be used for conduit coupling to all vibrating and shifting equipment.

2.08 DEVICES

A. BOXES

1. Concealed device boxes shall be of zinc-galvanized steel type with shape and size best suited for the particular application, rated for the location installed, and shall be supported directly to structure by means of screws, anchors, or bolts. Device boxes shall be FD series.
2. Exposed boxes located in outdoor or in moist locations shall be weatherproof (WP) PVC coated cast type with threaded hubs. Indoor exposed boxes not in moist locations can be non-coated cast type.
3. Box dimensions shall be in accordance with size, quantity of conductors, and conduit clearances per NEC articles 314 requirements.

B. SWITCHES

1. General purpose switches shall be manufactured in accordance with UL 20. Switches shall be one pole rated, 20 amps, at 277 VAC. Bodies shall be of ivory phenolic compound supported by mounting strap having plaster ears. Switches shall have copper alloy contact arm with silver cadmium oxide contacts. Switches shall have slotted terminal screws and a separate green grounding screw. Furnish Hubbell 1221, Leviton 1221, or approved equal.

C. RECEPTACLES

1. General purpose receptacles shall be duplex and rated 20 amps, 120 VAC, 2 pole, 3 wire grounding, NEMA 5-20R configuration, specification grade, and side wired to screw terminals. Face color shall be white or ivory. General purpose receptacles shall be Leviton 5362, Bryant, Hubbell, or approved equal.
2. GFI (ground fault circuit interrupting) receptacles shall be used in all boxes shown as weatherproof. GFI receptacles shall be duplex, 20A, 120V, with "test" and "reset" buttons with shallow design for mounting and standard screw terminals for direct wiring. Receptacles shall be designed, manufactured, and tested to prevent nuisance tripping from voltage spikes, RFI, EMI, or electronic component failures. Chaining multiple receptacles from one GFI unit is not acceptable. GFI receptacles shall be Leviton 6899, Arrow-Hart or approved equal.

D. DEVICE PLATES and COVERS

1. General purpose device plates and covers shall be stainless steel. Plates or covers shall be attached with stainless steel screws. Circuit breaker number and panelboard name shall be stamped on each cover.
2. PVC coated device boxes shall have PVC coated gasketed covers.
3. Weatherproof switch, outlet, and receptacle boxes shall be fitted with gasketed covers rated for wet locations in accordance with NEC 406.9.

4. Metal access cover for weatherproof receptacles shall have a cover to maintain the weatherproof integrity even when a plug is connected to the receptacle. Screws and hinge springs shall be stainless steel. Weatherproof access covers shall be Hubbell, TayMac, Crouse-Hinds, or approved equal.
5. Receptacle and light switch plates shall be stamped or engraved as specified herein.

2.09 COMPONENTS

A. Fuses

1. Fuses used in circuits 200 VAC and above shall be time-delay type FNQ or approved equal, 13/32” x 1-1/2”, and have an interrupting rating of 42,000 AIC at 500 VAC. Fuse holders shall be of the barrier type and rated 600 VAC.
2. Fuses used in 120 VAC shall be time-delay type MDL or approved equal, 1/4” x 1-1/4”, and have a rating of 250 VAC. Fuse-holders shall be of the terminal block type.
3. Fuses used in signal and 24 VDC circuits shall be fast acting type GMA or approved equal, 5 mm x 20 mm/1/4” x 1-1/4”, and have a rating of 250 VAC. Fuse-holders shall be of the terminal block type.
4. Fuses shall be sized in conformance with the NEC.

B. Relays and Timers

1. GENERAL: Relays and timers shall be provided with N.O. or N.C. contacts as shown on the Contract drawings. All spare contacts shown shall be provided. Contacts shall be rated 10 amps minimum at 120 VAC, 60 Hz unless otherwise stated. Supply power or coil voltage shall be 120 VAC unless shown otherwise on the Contract drawings. Relays and timers shall be designed for continuous duty. All relays shall be U.L. listed. The following is a summary of abbreviations associated with relays and timers:
2. Interposing PLC Control relays (CR) shall be plug-in type with indicating lights enclosed housing to exclude dust. Provide Finder 4C series, Allen-Bradley, Eaton or approved equal.

C. Circuit Breakers

1. Circuit breakers shall be of the indicating type, providing ON, OFF and TRIPPED positions of the operating handle. Circuit breakers shall be quick-make, quick-break, with a thermal-magnetic (TM) action or Motor Circuit Protectors (MCP) as shown on One-Line Diagrams. Circuit breakers feeding Soft Starters or VFDs shall have true adjustable long, short and instantaneous trip units.
2. Main Circuit breakers shall be the bolted on type. The use of tandem or dual circuit breakers in a normal single-pole space to provide the number of poles or spaces specified are not acceptable. All multiple-pole circuit

breakers shall be designed so that an overload on one pole automatically causes all poles to open. Main Circuit breakers and motor circuit protectors shall be manufactured by Eaton, G.E., ITE, or approved equal.

3. Each 480 volt or 240V circuit breaker shall have a minimum interrupting capacity of 35,000 amperes. Each 120 volt breaker shall be rated for a minimum 10,000 amperes interrupting capacity. Breakers shall be sized as shown on Drawings and as necessary for the supplied equipment.
4. Fused disconnects shall not be used in place of breakers.
5. Breakers shall be sized and have a minimum interrupting capacity as shown on Drawings and as required for the supplied equipment.
6. All breakers shall be supplied with the correct sized copper only lugs for wire sizes as listed in “Conduit & Wire Routing Schedule”. Provide larger frame breaker or lug adapters as necessary when connecting to the listed oversized wire or wire as required for the horsepower of the supplied equipment.

D. Control Panel Terminal Blocks:

1. General
   a. Terminal blocks to be screw type, 6mm spacing, 600 volt, minimum rating of 30 amps, and mounted on DIN rail, Entrelec, IDEC, Phoenix Contact. DIN rail shall be same type as used for the relays. Install an extra DIN rail on each type of terminal strip with 20% spare terminals for future additions.
   b. Provide terminal blocks with "follower" plates that compress the wires and have wire guide tangs for ease of maintenance. Terminal blocks that compress the wires with direct screw compression are unacceptable. All power, control and instrument wires entering and leaving a compartment shall terminate on terminal blocks with wire numbers on terminals and on both ends of the wires.
   c. Terminal Tags and Markers: Each terminal strip shall have a unique identifying alphanumeric code at one end. Numbers shall be assigned to all blocks except grounding blocks. Fuse blocks shall be assigned unique tag numbers such as FU1, FU2. No two fuses shall be assigned the same tag number. Terminal blocks are to be labeled to match the wire landed.
   d. Terminal blocks shall be physically separated into groups by the level of signal and voltage served. Power and control wiring above 100 volts shall have a separate group of terminal blocks from terminal blocks for wiring below 100 volts, intermixing of these two types of wiring on the same group of terminal blocks is not allowed.
   e. Provide a ground terminal or connection point for each grounding conductor.
   f. Provide a separate terminal block for every two neutral terminations or as coordinated with the interconnect diagrams.

2. Power Termination Blocks shall be rated for 600V main power connection. The power termination blocks shall be rated to accept Copper or Aluminum cable rated as shown on Contract one-line diagrams. The power termination block shall be capable of being mounted anywhere in a termination box. Each termination block shall be provided with lug shield to prevent contact with power connections. The power termination blocks shall be Connectron, Cooper or approved equal.

2.10 PULL BOXES

A. Underground pull boxes, where shown or required by length of conduit runs, shall be prefabricated concrete type with the size shown on the Drawings or larger to allow for adequate pull area. Extension sections shall be provided as necessary to reach the depth of underground conduits. All boxes shall have galvanized steel hold down bolts and hardware. Boxes located in paved areas or other areas which vehicles may travel shall be H/20 loading rated and have diamond plate steel traffic covers. Steel covers or lids shall be galvanized. Pull box covers shall be labeled with pull box designation. All underground pull boxes shall have a 12-inch bedding of ¾-inch nominal crushed rock. Pull boxes shall be Christy Concrete Products, Brooks, or approved equal.

2.11 GROUNDING SYSTEM

A. Install #2/0 or #1/0 bare copper ground bond wires to the various locations shown on the drawings.

B. Ground clamps shall be bolt-on type as manufactured by ILSCO type AGC, O-Z Gedney type GRC, or approved equal.

C. All ground rod, pipe, and steel plate and buried bond connections shall be made by welding process equal to Cadweld.

D. Grounding conductors shall be sized as shown on the Plans or in accordance with NEC Table 250.66, whichever is larger.

E. Grounding and bonding wires shall be installed in all conduits and raceways and connected to the grounding termination point in all equipment. Conduit grounding bushings shall be set screw locking type electra-galvanized malleable iron with insulation collar and shall be provided with a feed through compression lug for securing the ground bonding wire. Ground bonding wire shall be bare wire and shall be sized per NEC.

F. The ground rod shall consist of not less than 10 continuous feet of 3/4 inch copper coated electroplated high grade carbon steel. The ground rod shall be a NEHRING type NCC, Weater 348 or approved equal.

G. Ground buses shall be provided in all electrical enclosures. Each ground bus shall be sized as shown on the Contract drawings or specified herein. The ground bus shall be adequately sized for the connection of all grounding

conductors required per NEC. Screw type lugs shall be provided on all ground busses for connection of grounding conductors.

H. Each ground bus shall be copper. Screw type fasteners shall be provided on all ground busses for connection of grounding conductors. Ground bus shall be a Challenger GB series, ILSCO CAN series or approved equal.

I. The system neutral conductor and all equipment and devices required to be grounded by the National Electrical Code shall be grounded in a manner that satisfies the requirements of the National Code.

J. The system neutral (grounded conductor) shall be connected to the system's grounding conductor at only a single point in the system. This connection shall be made by a removable bonding jumper sized in accordance with the applicable provisions of the National Electrical Code if the size is not shown on the Drawings. The grounding of the system neutral shall be in the enclosure that houses the service entrance main overcurrent protection.

K. One side of the secondary on all transformers and DC power supplies shall be grounded to the ground bus.

L. All raceway systems, supports, enclosures, panels, motor frames, and equipment housings shall be permanently and effectively grounded.

M. All receptacles shall have their grounding contact connected to a grounding conductor.

N. Branch circuit grounding conductors for receptacles or other electrical loads shall be arranged such that the removal of a lighting fixture, receptacle, or other load does not interrupt the ground continuity to any other part of the circuit.

O. Attachment of the grounding conductor to equipment or enclosures shall be by connectors specifically provided for grounding. Mounting, support, or bracing bolts shall not be used as an attachment point for ground conductors.

2.12 ELECTRICAL ENCLOSURES AND BOXES

A. Enclosures and boxes to be wall mounted, minimum 14 gauge, type 316 stainless steel with seams continuously welded & ground smooth, and fast access door latches. A copper ground bus shall be provided in the enclosure. Outer door shall have provisions for locking enclosure with standard padlock. Provide white backpan in box. Provide accessories consisting of breaker to disconnect incoming power, heater, fan, louvers, LED lights, and thermostats. All fans, vents and louvers shall be provided with removable metal filters. Enclosure shall be Hoffman, Circle AW or approved equal.

2.13 FIBER TERMINATION PATCH PANEL

A. All connectors shall be field-installable and perfectly matched to the cable used. The connectors shall provide tight fitting termination to the cladding and buffer coating. Epoxy-based or “hot melt “adhesives shall be used to bond the fiber and buffer to the connector ferrule and body prior to polishing the endface. No dry-termination or “quick crimp” connectors are allowed.

B. Fiber Termination panels shall be provided with splice trays, grounding/clamp kit, holders for pigtail and through fiber splicing and be provided with cabinet lock.

C. Termination panel shall be Panduit FWME2, Corning or approved equal. Termination panel shall be provided with two sets ST duplex multi-mode connectors (minimum), all hardware, options and accessories to provide for a complete installation of the fiber optic system. Provide 4 sets of 3 foot fiber patch cables and 4 sets of 6 foot fiber patch cables.

D. Panels shall be installed on side pan of Pedestal Control Panel and RTU Control Panel (located in the Electrical Room).

2.14 EXISTING CONTROL PANEL

A. Provide new router and fiber patch panel in existing RTU Control Panel per City Standard. Provide miscellaneous components for a complete and operable system.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. All work in this Section shall conform to the codes and standards outlined herein.

B. The Contractor shall employ personnel that are skilled and experienced in the installation and connection of all elements, equipment, devices, instruments, accessories, and assemblies. All installation labor shall be performed by qualified personnel who have had experience on similar projects. Provide first class workmanship for all installations.

C. Ensure that all equipment and materials fit properly in their installations.

D. Perform any required work to correct improper installations at no additional expense to the City.

E. The Engineer reserves the right to halt any work that is found to be substandard or being installed by unqualified personnel.

3.02 CONSTRUCTION METHODS, GENERAL

A. All field wires and panel wires shall have wire markers as specified in the “WIRE” subsection.

B. Wires shall not be spliced except where shown. Devices with pigtails, except lighting fixtures, shall be connected at terminal blocks. Equipment delivered with spliced wires shall be rejected and the Contractor required to replace all such wiring, at no additional cost to the City.

C. No wires shall be spliced without prior approval by the Engineer.

D. Where splices are allowed or approved by the Engineer they shall conform with the following:

1. Wire splicing devices shall be sized according to manufacturer's recommendations.
2. Splices of #10 and smaller, including fixture taps, shall be made with see-thru nylon self-insulated twist on wire joints; T & B "Piggys," Ideal "Wing-Nut" or approved equal.
3. Splices of #8 and larger shall be hex key screw two way connectors, with built in lock washers; T & B "Locktite", O-Z type XW or approved equal, insulated with 3M Scotch Super #88, Plymouth or approved equal.
4. Splices in underground pullboxes and exterior connection boxes shall be insulated and moisture sealed with 3M "Scotchlok" cast resin splice kits. Do not use splice kits with a date marking for shelf life that has expired.

E. Tapes shall conform to the requirements of UL 510 and be rated: 105 degrees C, 600V, flame retardant, hot and cold weather resistant. Vinyl plastic electrical tape shall be 7 mil black. Phase tape shall be 7 mil vinyl plastic, color coded as specified. Electrical insulation putty shall be rubber-based elastic putty in tape form. Varnished cambric shall be 9 mil cotton tape impregnated with yellow insulating varnish and adhesive backed.

F. Connections to terminals shall be as follows:

1. Use connector or socket type terminals furnished with component.
2. Connections to binding post screw, stud or bolt use:
   a. For #10 and smaller wire, T & B "Sta-Kon," Buchanan "Termend" or approved equal, self-insulated locking forked tongue lug.
   b. For #8 to #4/0 wire, T & B "Locktite," Burndy QA or approved equal lug of shape best suited.
3. Use ratchet type crimping tool which does not release until proper crimp pressure has been applied.

G. Equipment shall be wired and piped by the manufacturer or supplier. Major field modifications or changes are not allowed without the written "change

order" authority by the Engineer. When field changes are made, the components, materials, wiring, labeling, and construction methods shall be identical to that of the original supplied equipment. Contractor's cost to replace or rework the equipment to match original manufacturer or supplier methods shall be done at no additional cost to the City.

H. Mating fittings, bulkhead fittings, plugs, lugs, connectors, etc. required to field interface to the equipment and panels shall be provided by the supplier when the equipment is delivered.

I. All electrical and instrumentation factory as-built drawings associated with the equipment shall be provided with the equipment when it is delivered to the job site. Drawings for each piece of equipment shall be placed in clear plastic packets of sufficient strength that will not tear or stretch from drawing removal and insertion.

3.03 ELECTRICAL EQUIPMENT FABRICATION

A. Electrical Equipment cutouts for devices (i.e. indicating lights, switches) shall be cut, punched, or drilled and smoothly finished with rounded edges. Exposed metal from cutouts that are made after the final paint finish has been applied shall be touched up with a matching paint prior to installing device. Do not paint nameplates, labels, tags, switches, receptacles, conductors, etc.

B. All panel doors shall be fully gasketed with non-shrinkable, water and flame resistant material.

C. Bolts and screws for mounting devices on doors shall be as specified by the manufacturer; otherwise they shall have a flush head which blends into the device or door surface. No bolt or screw holding nuts shall be used on the external surface of the door.

D. Each component within the panel shall be securely mounted on an interior cubicle or backpan and arranged for easy servicing, such that all adjustments and component removal can be accomplished without removing or disturbing other components. Mounting bolts and screws shall be front located for easy access and removal without special tools. Access behind the sub panel or backpan shall not be required for removing any component.

E. A ground bus shall be provided in each bussed MCC section, enclosure or cabinet. It shall have provisions for connecting a minimum of ten grounding conductors. Screw type lugs shall be provided for connection of grounding conductors. All grounding conductors shall be sized as shown on plans or in accordance with NEC Table 250.66, whichever is larger.

F. Minimum wire bending space at terminals and minimum width of wiring gutters shall comply with NEC tables 312.6 (A) & (B).

G. Future device and component mounting space shall be provided on the door, backpan, and subpanel where detailed on the Drawings. Where no detail is shown, provide a minimum of 15 percent usable future space. Also, add extra DIN rail to allow adding relays & terminal blocks in the future as called out on Contract drawings.

H. Doors shall swing freely a minimum of 90° and close with proper alignment.

I. HARNESS: Where space is available, all wiring shall be run in slotted plastic wire ways or channels with dust covers. If space is not available for wireways, then all wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by screw attached retainer. Wire ways or channels shall be sized such that the wire fill does not exceed 60%. Tie-wraps shall be T&B TY-RAP or approved equal.

J. HINGE LOOPS: Where wiring crosses hinged surfaces, provide a “U" shaped hinge loop protected by clear nylon spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections. Spiral wrap shall be Graybar T25N or approved equal.

K. RETAINERS: Wire ways, retainers, and other devices shall be screw mounted with round-head 316 stainless steel screws or mechanically mounted by push-in or snap-in attachments. Glue or sticky back attachment of any type or style shall not be used. Retainers shall be Panduit High Bond Adhesive back mounts SGABM series, or approved equal.

L. ROUTING: Wires shall be routed in slotted plastic wire-ways with snap covers. Wires carrying 120 VAC shall be separated as much as possible from other low voltage wires and signal cables, and shall be routed only in ducts for 120 VAC. If the power wiring has to cross the signal wiring, the crossing shall be as close to a right angle as possible. Ducts for 24 VDC wiring shall be used for all other wires and cables. Routing of 120 VAC in combined ducts is not allowed without prior written approval of the Engineer. Wires and cable shall be routed along the shortest route between termination points, excepting routes which would result in routing 120 VAC and other wires and cables in the same duct. Wires and cables shall have sufficient length to allow slack and to avoid any strain or tension in the wire or cable. Wires and cables shall be placed in the ducts in a straight, neat and organized fashion and shall not be kinked, tangled or twisted together. Additional wire ducting shall be provided for use by the electrical subcontractor for routing field wires to their landing points in the each electrical and instrumentation panel.

M. Wiring not routed in duct work shall be neatly bundled, treed, and laced with plastic ties. Wiring across door hinges shall be carefully made up and supported to avoid straining and chafing of the conductors or from putting any strain on their terminals.

N. TERMINATIONS: Single wire and cable conductors shall be terminated according to the requirements of the terminal device. All terminations must be made at terminals or terminal blocks. Use of spring or buttsplice connectors is not allowed.

1. Provide 3” minimum separation between wireway and terminal blocks. Installation of wireways too close to terminal blocks will be required to be completely reworked to the satisfaction of the Engineer.
2. For captive screw pressure plate type terminals, the insulation shall be removed from the last 0.25 inches of the conductor. The conductors shall be inserted under the pressure plate to full length of the bare portion of the conductor and the pressure plate tightened without excess force. No more than two conductors shall be installed in a single terminal. All strands of the conductor shall be captured under the pressure plate.
3. For screw terminals, appropriately sized locking forked spade lugs shall be used. Lugs shall be crimp-on type that forms gas tight connections. All crimping shall be done using a calibrated crimping tool made specifically for the lug type and size being crimped.
4. On shielded cables, the drain wire shall be covered with insulating tubing along its full bare length between the cable jacket and the terminal lug or terminal pressure plate.
5. For screwless terminals, wire shall be stripped back and inserted per the manufacturer's instructions. When stripping insulation from conductors, do not score or otherwise damage conductor.
6. Heat shrink shall be placed on ends of shielded cable to cover foil.
7. Additional condulets with terminal blocks shall be supplied for wire termination to devices with leads instead of terminals. (I.e. solenoid valves, level probe, etc.)

O. All devices and wiring shall be permanently labeled.

P. All components associated with a particular compartment's or enclosure's function shall be mounted in that compartment or enclosure.

Q. No fastening devices shall project through the outer surfaces of equipment.

R. Spacing and clearance of components shall be in accordance with UL, JIC, and NEC standards.

3.04 DELIVERY

A. Contractor shall inspect each electrical and instrumentation item delivered to the jobsite.

B. Contractor shall unpack each item for inspection within two (2) days of arrival.

C. Complete written inventory shall be produced by Contractor and submitted to Engineer within (2) days after arrival on jobsite for record keeping prior to any payment for the item.

3.05 DAMAGED PRODUCTS

A. Damage products will not be accepted. All damaged products shall be replaced with new products at no additional cost to the City.

3.06 FASTENERS & LUGS

A. Fasteners for securing equipment to walls, floors, and the like shall be stainless steel.

B. Stainless steel anchor bolts, ½" minimum size, shall be installed for the Electrical Equipment in the front and back of each section at locations recommended by Electrical Equipment manufacturer.

C. Concrete pad with stainless steel anchor bolts shall be provided for all electrical freestanding equipment.

D. All wall mounted panels or enclosures shall be spaced out from wall by stainless steel unistrut or stainless steel spacers with minimum depth of 1/2".

E. All wire & cable lugs shall be copper; aluminum or aluminum alloy lugs shall not be used. The Electrical Contractor shall supply all lugs to match the quantity & size of wire listed in the conduit & wire routing schedule.

3.07 INSTALLATION, GENERAL

A. Install all products per manufacturer's recommendations and the Drawings.

1. Contract Drawings are intended to show the basic functional requirements of the electrical and instrumentation system and do not relieve the Contractor from the responsibility to provide a complete and functioning system.
2. Provide all necessary hardware, conduit, wiring, fittings, and devices to connect the electrical equipment provided under other Sections. The following shall be done by the Contractor at no additional cost to the City:
    a. Provide additional devices, wiring, conduits, relays, signal converters, isolators to complete interfaces of the electrical and instrumentation system.
    b. Changing normally open contacts to normally closed contacts or vice versa.
    c. Adding additional relays to provide more contacts as necessary.
    d. Installing additional terminal blocks to land wires.
3. All programmable devices shall be programmed, set-up and tested by the Contractor prior to startup. This includes all instruments, and valves.

Programming and set-up parameters shall be adjusted or changed as directed by the City or Engineer during start-up and throughout the warranty period, at no additional cost to the City. Record of all programming parameters setup for this project shall be recorded by Contractor and included in the final O&M manuals.

4. Coordinate with the Engineer and setup all alarm, process, and operation setpoints.
5. Device Mounting Heights: Mounting heights of fixtures and devices shall be as follows unless otherwise indicated or when height has to be adjusted to be over or under counter tops.
   a. Wall switches => 48 inches
   b. Convenience outlets => 18 inches finished areas
      => 24 inches non-finished areas
      => Top of box no more than 48 inches above floor
   c. Telephone outlets => 54 inches
   d. Bracket fixtures => 7 feet 6 inches

B. PANELS AND ENCLOSURES

1. Install panels and enclosures at the location shown on the Plans or approved by the Engineer.
2. Install level and plumb.
3. Seal all enclosure openings to prevent entrance of insects and rodents.
4. All conduits entering outdoor panels and enclosures shall use watertight hubs. These hubs shall be located on sides or bottom only. Top entry of outdoor panels or enclosures is not allowed unless specifically shown on plans.
5. Clearance about electrical equipment shall meet the minimum requirements of NEC 110.66.
6. All metal panel doors shall be installed with ground straps, including all MCC bucket doors.
7. Box supports shall be located and oriented as directed in field by the Engineer.

C. CONDUITS

1. Install conduit free from dents and bruises.
2. Care shall be exercised to avoid interference with the work of other trades. This work shall be planned and coordinated with the other trades to prevent such interference. Pipes shall have precedence over conduits for space requirements. Exposed conduits shall be neatly arranged with runs perpendicular or level and parallel to walls. Bends shall be concentric.

3. All conduits shall be labeled on all ends; at junction boxes, pull boxes, enclosures, stub-outs, or other terminations.
4. All conduit entering or leaving Electrical Equipment shall be stubbed up into the bottom horizontal wireway directly below the vertical section in which the conductors are to be terminated.
5. All conduits shall be labeled on all ends; at junction boxes, pull boxes, enclosures, stub-outs, or other terminations.
6. A maximum of three equivalent 90 degree elbows are allowed in any continuous runs. Install pull boxes where required to limit bends in conduit runs to not more than 270 degrees or where pulling tension would exceed the maximum allowable for the cable.
7. Route all above grade conduits parallel or perpendicular to structure lines and/or piping. Conduits installed above grade shall be braced in place with stanchions. Expansion joints shall be installed every 100 feet.
8. Conduits installed outdoor or in NEMA 4X rated areas above grade shall be braced in place with stainless steel Unistrut stanchions or PVC coated clamps with backplates.
9. In pullboxes and vaults separate power “L & P” wiring to one side within and all other wiring “A, C, D & V” wiring to opposite side in bundles. In vault, these separate bundles are to be supported on plastic cable supports rated for the bundle loading.
10. Verify pullboxes are sized appropriately for conduit entry per Conduit and Wire Routing Schedule.
11. Special “Soft–Jaw” type pipe clamps shall be used to prevent damage to PVC-coated conduits while field threading, cutting to length, and coupling sections.
12. Conduits shall be painted to match the color of surface attached to as directed by Engineer.
13. Spare or Future Conduits:
    a. All spares conduits shall be labeled; the conduits shall be mandrelled and have pull ropes (pull tapes) installed.
    b. Pull rope shall be ½” wide, polyester, rated 1250 pounds tensile strength. Provide a waterproof label on each end of the pull rope to indicate the destination of the other end. Pull tape shall be printed with sequential footage. Pull tape shall be Neptco Muletape WP1250P or approved equal.
    c. Provide caps on conduit ends to prevent entrance of dirt or insects.
14. All existing conduits that are reused shall have a mandrel pulled through the entire conduit run to prove the length contains no blockages or obstructions. Mandrelling shall be witnessed by the Engineer.

15. For conduit runs over 100', Contractor shall have a mandrel pulled through the entire conduit run to prove the length contains no blockages or obstructions. Mandrelling shall be witnessed by the Engineer.

D. CONDUIT AND WIRE ROUTING SCHEDULE:

1. Conduit material, wire size, and quantity listed in schedule take precedence over this Section Specifications.
2. All of the entries for each line in the conduit schedule apply to each conduit when multiple quantity of conduits (quantity of which are indicated by number entered in conduit no. column in schedule) are listed in the schedule.
3. Wire sizes listed are in AWG or Kcmil and are copper conductors.
4. Extra wire was intentionally placed in the "Conduit & Wire Routing Schedule" which shall be labeled on both ends with a unique wire label.
5. Contractor to supply and install all conduits and wiring as shown on Utility Engineered Design drawings. Utility primary and secondary conduit and wiring shown in "Conduit and Wire Routing Schedule" is for bid purposes only. A credit or add-on will be provided by Contractor based on the actual work performed by Contractor for the Utility service.
6. All control and signal wiring terminations shall have the correct wire label applied prior to making connection.
7. Conduit entries listed as "GRS-PVC" in the Conduit & Wire Routing Schedule are to be "Galvanized Rigid Conduits with PVC coating" the entire length.
8. Vertical offsets and sloping of conduits are not detailed on plans; the Electrical Contractor shall include in his bid the price for the complete conduit run utilizing the civil & mechanical plans to measure vertical & slope distances.

E. EXCAVATION AND BACK FILLING:

1. The Electrical Contractor shall provide the excavation for equipment foundations and trenches for conduits or buried cables.
2. Trenches for all underground utility lines shall be excavated to the required depths.
3. Repave any area that was paved prior to excavation. Backfill and surface all areas as shown on the Drawings or where not shown to the original condition that was present prior to the excavation.
4. Underground conduits outside of structures shall have a minimum cover of 24 inches except for utility conduits depth shall be as required by the governing utility requirements. Back filling shall be done only after conduits have been inspected.

5. Contractor shall uncover any uninspected covered conduit trenches, at no additional cost to the City, to verify proper installation.
6. Excavation and back fill conduit trenches shall conform to the requirements of the Earthwork Section of these Specifications, unless modified on plans, and to other entities as required.
7. At all times during the installation of the electrical distribution system, the Contractor shall provide barricades, fences, guard rails, etc., to safeguard all personnel, including small children, from excavated trenches.

F. Wiring, grounding, and shielding: It is important to observe good grounding and shielding practices in the generally noisy environment in this application. The shield of shielded cables shall be terminated to ground at one end only, and covered with insulated heat shrink tubing. The shield at the other end shall be encased in an insulated material to isolate it from ground.

G. Seals

1. Seal around all conduits, wires, and cables penetrating between electrical panels, walls, ceilings, and floors in all buildings with a fire stop material. Seal shall be made at both ends of the conduit with a fire-stop putty. Seal shall have a minimum two hour rating. Fire stop sealing shall be International Protective Coatings Flamesafe, or approved equal.
2. Seal around conduits entering outside to inside structures and around bottom of free standing enclosures to maintain watertight integrity of structure.
3. Place conduit seal inside each underground conduit riser into panels and enclosures to prevent entrance of insects and rodents.
4. Conduit entrances: Seal each conduit entrance from below grade into the panel and other electrical enclosures with plugging compound sealant to prevent the entrance of insects and rodents. Conduits between the enclosures shall be sealed with plugging compound sealant on each end. Plugging compound sealant shall be PRC-DeSoto (formerly Courtaulds) Aerospace Semco PR-868 or approved equal.
5. Seal conduits entering any electrical instrument. Install conduit drain boxes and plug conduit interior to form an effective barrier to keep out water traveling into equipment or instrumentation from conduit installed higher than equipment or instrumentation.

H. HOUSEKEEPING PADS

1. Concrete housekeeping pads are required for all free standing electrical equipment. Housekeeping pads shall be 3-1/2” inches above surrounding finished floor or grade unless otherwise shown and shall be 4 inches (minimum) larger in width on all sides of equipment. The depth of housekeeping pads shall be 18 inches (minimum).

2. Housekeeping pads shall be installed for future units as shown on the Contract Drawings.
3. Housekeeping pad shall be Class “A” concrete with rebar crossway network. The minimum size rebar allowed is #3. Concrete shall be precisely leveled so that equipment set in place will not require shimming.

I. CLEANING AND TOUCH UP

1. Prior to startup and at completion of the work prior to final acceptance, all parts of the installation, including all equipment, exposed conduit, devices, and fittings shall be cleaned and given touch up by Contractor as follows:
   a. Remove all grease and metal cuttings.
   b. Any discoloration or other damage to parts of the building, the finish, or the furnishings, shall be repaired.
   c. Thoroughly clean any of his exposed work requiring same.
   d. Vacuum and clean the inside of all MCC and electrical and instrumentation enclosures.
   e. Clean all above and below ground pull boxes, junction boxes, and vaults from all foreign debris prior to final acceptance.
   f. Paint all scratched or blemished surfaces with the necessary coats of quick drying paint to match adjacent color, texture, and thickness. This shall include all prime painted electrical equipment, including enclosures, panels, poles, boxes, devices, etc.
   g. Repair damage to factory finishes with repair products recommended by Manufacturer.
   h. Repair damage to PVC or paint finishes with matching touchup coating recommended by Manufacturer.

3.08 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Provide three (3) sets Operation and Maintenance manuals bound in three ring binders with one set made up completely with original manuals prior to start up.

B. O&M manuals shall provide at least the following as a minimum:

1. A comprehensive index.
2. A complete "Record" set of favorably reviewed electrical submittals as provided under SUBMITTAL AND DRAWING REQUIREMENTS.
3. As-built one-line, elevation, loop, elementary and interconnection drawings with all field changes included.
4. A complete list of the equipment supplied, including serial numbers, ranges, catalog cuts, and pertinent data.
5. Full specifications on each item.

6. Detailed service, maintenance and operation instructions for each item supplied. Schematic diagrams of all electronic devices shall be included. A complete parts list, including stock numbers, shall be provided on the components that make up the assembly.
7. Record of each breaker and overload heater element including Manufacturer, full part number, size, setting etc.
8. Record of each motor nameplate data including manufacturer, full part number, size, etc.
9. Safety precautions and procedures.
10. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
11. Spread sheet listing all setpoints and programmable parameters entered for this project for instruments, VFD, HIM, etc.
12. Include all completed and signed test data and forms from factory and field testing.
13. All of these sets of O & M Manuals shall be made up of "original" (no copies, PDFs or reproductions) documents. No photo or fax copies are allowed of standard published manuals available from Manufacturers.
14. Warranty certificate with start dates, duration and contact information.
15. Troubleshooting instructions.
16. Record of all settings or parameters for all programmable devices.
17. Provide heavy duty tabs separating sections.

C. At the end of the project these manuals shall be updated to show "as-built" conditions.

D. Provide to the City four (4) each USB drives with lanyards and two sets of DVDs containing all documents in both PDF format and unlocked AutoCAD - DWG format, version 2010 or later including:
1. As-built Contract electrical and instrumentation drawings prepared for this project.
2. As-built set of all required Drawings for the project.
3. As-built sets of other computer generated documents prepared for this project, including PLC ladder logic files, and Bill of Materials prepared for this project.
4. Electronic PDF version of O&M manual. Version format shall follow the hard copy submittal of the O&M, including index, equipment record sheet, warranty information, theory of operation, maintenance instruction, etc. Bookmarks shall be descriptive of actual document, tab, etc. Failure to bookmark PDF or broken bookmarks may be grounds for immediate

rejection without review. Bookmarks shall not be out of order; the English description shall match that listed in the Submittal's Table of Contents.

5. These files shall be the property of the City, for its use on this and future projects.

3.09 TESTING

A. GENERAL REQUIREMENTS

1. It is the intent of these tests to assure that all equipment is operational within industry and Manufacturer's tolerances and is installed in accordance with design plans and specifications
2. All equipment setup and assembled by the Contractor shall be in accordance with the design plans and Drawings and the Manufacturer's recommendations and instructions and shall operate to the Engineer's satisfaction.
   a. Follow all Manufacturers' instructions for handling, receiving, installation, and pre-check requirements prior to energization.
   b. After energization, follow Manufacturer's instructions for programming instrumentation, set-up and calibration of equipment.
   c. The Contractor shall be responsible for, and shall correct by repair or replacement, at his own expense, equipment which, in the opinion of the Engineer, has been caused by faulty mechanical or electrical assembly by the Contractor.
   d. Necessary tests to demonstrate that the electrical and mechanical operation of the equipment is satisfactory and meets the requirements of these Specifications shall be made by the Contractor at no additional cost to the City.
3. The testing shall not be started until the Manufacturer has completed fabrication, wiring, and setup, has performed satisfactory checks and adjustments and can demonstrate the system is complete and operational. Certification of completion of Contractor's in-house tests shall be submitted prior to scheduling of factory testing.
4. Factory tests shall not be scheduled until submittals associated with the equipment have been approved by the Engineer.
   a. If equipment is significantly different from submittal drawings, this shall be grounds for cancellation and rescheduling of factory tests at no additional costs to the City or extension of Contract time.
   b. Engineer reserves the right to postpone the factory test, at no additional cost to the City, until the submittal associated with the factory test has been reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted." No extension of Contract time will be allowed.
5. The first Pre-Energization tests shall be performed to determine the suitability for energization and shall be completed with all power turned off

and complete prior to the start of any of the Post-Energization tests. The Electrical Contractor shall have qualified personnel on the job site for all Pre-Energization and Post-Energization tests.

6. All tests shall be witnessed by the Engineer and/or City personnel. The test forms shall be completed by the testing person for field checkout, testing, and calibration of all equipment and instruments. All filled in test forms shall be given to the Engineer and/or City the day of the test. Fill in two sets of test forms if Contractor wants to keep a copy. All tests shall be documented in writing by the supplier and signed by the Engineer as satisfactory completed. The supplier shall keep a detailed log of all tests that failed or did not meet specifications, including date of occurrence and correction. Completed forms with proper signatures and dates shall be included and become a component of the Operations and Maintenance Manual for each of the respective systems.
7. The Contractor shall notify the City and the Engineer of the Supplier's readiness to begin all factory and field tests in writing (a minimum of ten working days prior to start), and shall schedule system checkout on dates agreed to by the City and the Engineer in order that the testing be scheduled and witnessed.
8. The Contractor shall fill in & submit for approval the “Scheduled Test Request Form” located in Appendix “A” for each requested inspection, factory and field test.
9. The supplier shall submit for approval, the proposed factory & field testing sheets at least 24 days prior to the start of the tests. Each testing sheet shall have a title giving the type of test and entry spaces for the name of the person who performed the test, name of the person who witnessed the test, and the date. Tests performed without approved forms shall be retested at no additional cost to City.
10. Separate test procedures in separate binders shall be submitted for approval for the Factory and Field Tests. Testing shall not commence until the test procedures have been reviewed and approved by the Engineer.

B. FAILURE TO MEET TEST

1. If the results of any of tests are unacceptable to the Engineer, the Contractor shall make corrections and perform the tests again until they are acceptable to the Engineer; these additional tests shall be done at no additional cost to the City.
2. Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported to the Engineer. The Contractor shall replace the defective material or equipment and have tests repeated until test proves satisfactory to the Engineer without additional cost to the City.

C. SAFETY

1. Testing shall conform to the respective manufacturer's recommendations. All manufacturers' safety precautions shall be followed.
2. The procedures stated herein are guidelines for the intended tests, the Contractor shall be responsible to modify these tests to fit the particular application and ensure personnel safety. Absolutely no tests shall be performed that endanger personal safety.
3. The Electrical Contractor shall have two or more Electricians present at all electrical field tests.
4. Two non-licensed portable radios are to be made available by the Contractor for the testing organization to conduct tests.
5. California Electrical Safety Orders (ESO) and Occupational Safety and Health Act (OSHA): The Contractor is cautioned that testing and equipment shall comply with ESO and OSHA as to safety, clearances, padlocks and barriers around electrical equipment energized during testing.
6. Field inspections and pre-energization tests shall be completed prior to applying power to equipment.

D. ELECTRICAL FACTORY TESTS

1. The system supplier shall conduct a thorough and complete factory test by qualified factory-trained personnel witnessed by the Engineer per the criteria specified herein. Factory test shall be held within 150 miles of project location.
2. All components of the “system setup” shall be completely assembled and thoroughly pre-tested by the supplier or Manufacturer before start of factory test. The “System Setup” for factory testing shall consist of, but is not limited to control panels, load centers and any miscellaneous associated electrical equipment.
3. Temporary wiring and equipment shall be setup during these tests to simulate the complete assembled system.
4. The tests, as a minimum, shall simulate all operating conditions including steady state, transients, upsets, startup, shutdown, power failure, and equipment failure conditions (for control logic).
5. The length of the factory testing shall be a minimum of 8 hours all on one day. If in the opinion of the City or Engineer the factory testing is not completed at the end of the working day, the testing shall be extended, at no additional cost to the City or extension in Contract time.
6. All factory tests shall be conducted at the System Supplier’s facility. All factory tests shall be completed prior to installation of any of the panel system at the jobsite. The panel system shall be fully assembled and connected as it will be installed in the final configuration. If the panel system is found to be not fully and completely ready for factory testing, the

Contractor shall be responsible for paying for the City and Engineer to return for the factory testing. Factory testing is to ensure that there are no defects. The hardware shall be tested for compliance with the plans and Specifications included herein and for the ability to perform the control functions.

7. Provide a complete clean copy of System Supplier drawings for City and Engineer's use during Factory Test. These drawings shall reflect the equipment being tested. If the Engineer determines that these drawings do not adequately reflect the actual equipment being tested or differs substantially from the approved equipment submittal, the Engineer reserves the right to cancel the Factory Test as the equipment is found to be not fully and completely ready for factory testing. Equipment that differs substantially from the approved equipment submittal shall be resubmitted. Factory test will be rescheduled after revised submittals have been reviewed by the Engineer and marked "No Exceptions Taken" or "Make Corrections Noted". No extension of Contract time will be allowed.
8. The associated factory tests for each of the factory testing sheets that are to be performed by the supplier and witnessed by the Engineer shall include the following panel system as a minimum:
   a. Inspections of the panel as follows:
      1) Visual and mechanical, for compliance with Contract and submittal drawings.
      2) Inspect for physical damage, proper support, and wiring.
      3) The Contractor shall fill in test form TF4 located in Appendix "A".
9. The factory test will be considered complete only when the system setup has successfully passed all tests, both structured and unstructured, to the satisfaction of the City or Engineer and the Factory Test checkout form TF11 has been signed & dated by the City. No equipment shall be shipped to jobsite without authorization from the Engineer that the factory test has been completed.
10. The testing personnel shall provide all material, equipment, labor and technical supervision to perform such tests and inspections.
11. During the testing period, under the supervision of the supplier, the Engineer and other City personnel shall have unlimited and unrestricted access to the usage and testing of all hardware and software in the system.
12. Spare parts for the system shall also be tested during this test period. The supplier shall prove by temporarily connecting the spare hardware to the system that any or all of the spare parts function in a manner equivalent to the original equipment under test.
13. Spare parts for the system shall also be tested during this test period. The supplier shall prove by temporarily connecting the spare hardware to the system that any or all of the spare parts function in a manner equivalent to the original equipment under test.

14. The Contractor shall pay all expenses incurred by his personnel, including labor, material, transportation, lodging, daily subsistence, and other associated incidental costs during the factory testing.
15. Faulty and/or incorrect hardware operation of major portions of the system may, at the discretion of the Engineer, be cause for suspension or restarting of the entire factory test, at no additional cost to the City or extension in contract time.
16. Acceptance and witnessing of the factory tests does not relieve or exclude the Contractor from conforming to the requirements of the Contract Documents.
17. All modifications to documentation as a result of the factory tests shall be corrected and completed before the submittal and delivery of "operation and maintenance" manuals.
18. Copies of the completed and witnessed factory testing forms shall be placed in the Operation and Maintenance Manual.

E. ELECTRICAL FIELD TESTS

1. Prior to any field testing, Interconnection Drawings and Operation & Maintenance Manuals shall have been submitted by the Contractor and approved by the Engineer.
2. PRE-ENERGIZATION TESTS: These tests shall be completed prior to applying power to any equipment.
   a. INSPECTIONS
      1) Visual and Mechanical
         a) Inspect for physical damage, proper anchorage, and grounding.
         b) Compare equipment nameplate data with design plans and starter schedule.
         c) Compare overload setting with motor full load current for proper size.
      2) The Contractor shall compile, by visual inspection of equipment installed for each motor, the following data in neatly tabulated form:
         a) Equipment driven
         b) Motor horsepower
         c) Nameplate amperes
         d) Service factor
         e) Temperature rating
         f) Overload catalog number
         g) Overload current range and setting
         h) Circuit breaker rating

3) Circuit breaker trip setting, for magnetic only circuit breakers.
4) The Contractor shall fill in, for each piece of equipment, Test Form TF4 located in Appendix “A”.

b. TORQUE CONNECTIONS:
1) All electrical, mechanical and structural threaded connections inside equipment shall be tightened in the field after all wiring connections have been completed. Every worker tightening screwed or bolted connections shall be required to have and utilize a torque screwdriver/wrench at all times. Torque connections to the value recommended by the equipment manufacturer. If they are not available, use NEC ANNEX I as guidelines.

c. WIRE INSULATION & CONTINUITY TESTS:
1) All devices that are not rated to withstand the 500V megger potential shall be disconnected prior to the megger tests.
2) Megger insulation resistances of all 600 volt insulated conductors using a 500 volt megger for five seconds. Make tests with circuits installed in conduit and isolated from source and load. Each conductor shall be meggered conductor to conductor and conductor to ground. These tests shall be made on cable after installation with all splices made up and terminators installed but not connected to the equipment.
3) Megger insulation resistances of all motor leads using a 500 volt megger for ten seconds. Make these tests with motors installed in place and not connected to any other wiring. Each motor lead shall be tested conductor to ground.
4) Each megger reading shall not be less than 100 Meg-ohms resistive. Corrective action shall be taken if values are recorded less than 100 Meg-ohms.
5) Continuity Tests: Each instrumentation conductor twisted shielded pair shall have the conductor and shield continuity measured with an ohmmeter. Conductors with high ohm values, that do not match similar lengths of conductors the same size, shall be replaced at no additional cost to the City.
6) The Contractor shall fill in test forms Power and Control Conductor Test Form TF1 and Instrumentation Conductor Test Form TF2 located in Appendix “A”.
7) Values of different phases of conductors in the same conduit run showing substantially different Meg-ohm values, even if showing above 100 Meg-ohms shall be replaced.

d. GROUNDING SYSTEM TESTS
1) VISUAL AND MECHANICAL INSPECTION
a) Verify ground system is in compliance with drawings and specifications.

2) ELECTRICAL TESTS
   a) Before making connections to the ground electrodes, and before placement of sidewalks, landscape and paving, measure the resistance of each electrode to ground using a ground resistance tester. Perform the test not less than two days after the most recent rainfall and in the afternoon after any ground condensation (dew) has evaporated.
   b) After all individual ground electrode readings have been made, interconnect as required and measure the system's ground resistance.
   c) Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.
   d) The grounding test shall be in conformance with IEEE Standard 81.
   e) Plots of ground resistance shall be made and submitted to the Engineer for approval.
   f) The current reference rod shall be driven at least 100 feet from the system under test.
   g) Measurements shall be made at 10 feet intervals beginning 25 feet from the test electrode and ending 75 feet from it in a direct line between the system being tested and the test electrode.
3) TEST VALUES
   a) The resistance between the main grounding electrode and ground shall be no greater than five ohms for commercial or industrial systems per IEEE Standard 142.
   b) Investigate point-to-point resistance values that exceed 0.5 ohms.
   c) The Contractor shall fill in Grounding System Test Form TF3 located in Appendix “A.”

e. PANELBOARD TEST
1) Visual and Mechanical Inspection
   a) Inspect for physical damage, proper anchorage and grounding.
   b) Compare equipment nameplate data with design plans.
   c) Compare breaker legend for accuracy.
   d) Check torque of bolted connections.
2) The Contractor shall fill in Panelboard Test Form TF5 located in Appendix “A”.

f. BREAKER TEST
1) All breakers shall be checked for proper mounting, conductor size, and feeder designation. Operate circuit breaker to ensure smooth operation. Inspect case for cracks or other defects. Check

tightness of connection with torque wrench in accordance with manufacturer's recommendations.

2) All breakers 100 amps and above shall be tested, including the generator breaker. Time current characteristic tests shall be performed bypassing three hundred percent (300%) rated current through each pole separately. Trip time shall be determined. Instantaneous pickup current shall be determined by run up or pulse method. Clearing times should be within four (4) cycles or less. All trip times shall fall within NETA Table values. Instantaneous pickup current levels should be within 20% of manufacturer's published values. Certification stickers, listing date and company who performed the tests, shall be attached to the inside of the breaker compartment door right after the breaker has passed all tests.
3) Contact and Insulation Resistance: Contact resistance shall be measured and be compared to adjacent poles and similar breaker. Deviations of more than 50% shall be reported to Engineer. Insulation resistance shall be measured and shall not be less than 100 megohms.
4) After the completion of all breaker tests, all TM & MCP breakers shall be set by Contractor to their proper settings to protect equipment.
5) The Contractor shall fill in Breaker Test Form TF9 located in Appendix “A”.

3. POST ENERGIZATION TESTS
   a. PANELS AND ENCLOSURE TESTS
      1) During these tests, test all local and remote control operations and interlocks.
      2) Electrical Tests:
         a) Perform operational tests by initiating control devices to affect proper operation.
         b) The Contractor shall fill in Operational Device Checks and Tests Form TF6.
   b. PHASE ROTATION TESTS:
      1) Check connections to all equipment for proper phase relationship. During this test, disconnect all devices which could be damaged by the application of voltage or reversed phase sequence. Three phase equipment shall be tested for the phase sequence “ABC” front to back, left to right, and top to bottom.
      2) All three phase motors shall be tested for proper phase rotation. Revise wire color codes to indicate correct phase color if wires are swapped.
      3) The Contractor shall fill in Phase Rotation Test Form TF7 located in Appendix “A”.

c. MOTOR TESTING:
    1) Record the amperage draw on all phases of each motor operating under full load. Ensure that these values do not exceed the motor nameplate full load amperage.
    2) Record the voltage between all phases of each motor operating under full load. If the voltage balance is not within plus or minus 5 percent of nominal, request the Utility power company or other responsible party to correct the problem.
    3) Record the Ohm's on phase to phase with low Ohms tester.
    4) The Contractor shall compile, by visual inspection of equipment installed for each motor, the following data in neatly tabulated form and be placed in the O&M manual:
        a) Equipment driven.
        b) Motor horsepower.
        c) Nameplate amperes.
        d) Service factor.
        e) Temperature rating.
        f) Overload catalog number.
        g) Overload current range and setting.
        h) Circuit breaker rating.
        i) Circuit breaker trip setting, for magnetic only circuit breakers.
        j) The Contractor shall fill in Motor Test Form TF10, located in Appendix "A."
        k) Additional motor testing requirements per Valve Specification.

d. INSTRUMENTATION TESTS
    1) Instrumentation tests shall be conducted per the following criteria:
        a) As a minimum, all the tests indicated/specified on the Instrument Data Sheet and Calibration Record Form TF14 in appendix "A" shall be performed by the Contractor all instruments listed in Appendix B "Device Index".
    2) Test equipment used for testing shall be of suitable quality so as not to mask performance deficiencies. All test equipment shall be traceable to National Bureau of Standards and have been calibrated within six months of test date.
    3) Testing shall be accomplished using simulated inputs only with prior written approval of the Engineer.
    4) The overall accuracy of each instrument loop shall be checked to ensure that it is within acceptable tolerance.
    5) All the I/O points for the PLC/OI shall be tested by Contractor for proper wiring. Where practical, the final element shall be used, i.e., trip the intrusion switch or change levels. During this task the Contractor shall have:
        a) Qualified field technician that has experience in the startup of similar systems to operate the field devices.

b) Test instruments as required.
c) A pair of radios for communication.
d) The Contractor shall fill in “I/O point Checkout Test Sheet” TF13.

6) Calibration stickers shall be installed on all instruments right after calibration has been successfully completed. Calibration stickers shall list the following information:
a) Tag number.
b) Calibrated by whom (name), firm, city and telephone number.
c) Date calibrated.
d) Calibration range.
e) Comments.

7) The Contractor shall provide a minimum of one (1) hour of field acceptance testing for each instrument. If any instrument has not been fully tested during its allotted time, the Contractor shall provide additional hours for finishing testing of the instrument, to be paid by the Contractor.

e. CONTROL SYSTEM TESTS

1) All the I/O points for the PLC shall be tested by the system supplier in the field with the Engineer for proper operation of alarms, status, analog, control, and Human Machine Interface (HMI/OI) display functions. Where practical, the final element shall be used, i.e. trip the intrusion switch or change levels. Testing shall be accomplished using simulated inputs only when necessary.

2) The overall accuracy of each instrument loop shall be checked to ensure that it is within acceptable tolerance.

3) All the I/O points for the PLC/OI shall be tested by Contractor for proper wiring. Where practical, the final element shall be used, i.e., trip the intrusion switch or change levels. During this task the Contractor shall have:
a) Test instruments as required.
b) A pair of radios for communication.

4) During this task the System supplier shall have:
a) Qualified field technician with experience in the startup of similar systems with PLC controls, and other field devices test instruments as required.
b) A pair of radios for communication.

5) The Contractor shall fill in “I/O Point Checkout Test Sheet” TF13.

4. TRIAL OPERATIONS:

a. The entire electrical installation shall be either tested or trial operated to verify Contract compliance. That is, controls, heaters, fans, light switches, convenience receptacles, lights, etc. shall be trial operated.

Contractor shall conduct trial operations in the presence of the Engineer and Operations and Maintenance personnel.

F. OPERATIONAL TESTING

1. After all the previous tests in this subsection are complete, the Contractor shall conduct operational testing.
2. Separate operations testing shall be provided for each chemical system including the temporary hydroxide system.
3. The Contractor shall demonstrate operation of each part of the control and instrumentation system to the satisfaction of the City and/or Engineer. Tests shall be repeated by the Contractor at no additional cost to the City and at the discretion of the City and/or Engineer to resolve whether the system has been demonstrated that it will operate under all modes of operations and varying conditions.
4. For the operational testing the new equipment shall be activated to automatically run for 5 days, Monday through Friday 24 hours a day. During this five day period the City will run the different combinations of the control options. If equipment failure occurs during the 5 days of operational testing, the Contractor shall repair or replace the defective equipment and shall begin another 5 day operational test, Monday through Friday 24 hours a day. This shall be continued until the new equipment functions acceptably for 5 consecutive days.

3.10 TRAINING

A. All training sessions shall be held on dates and times agreeable to City. A total of eight (8) or less City personnel shall be trained.

B. After Operation Testing has started the Contractor shall provide a period of not less than 8 hours training for instruction of operation and maintenance personnel in the use of all the new electrical, control and instrumentation systems. The Contractor shall make necessary arrangements with manufacturer's representative. Provide product literature and application guides for user's reference during instruction.

C. Training to include instruction on the use, operation, calibration, programming, and maintenance of the field devices listed in Appendix “B.”

D. Acceptable Operation and Maintenance Manuals shall be on site and available when training sessions are implemented.

3.11 SPARE PARTS

A. The Contractor shall supply all spare parts prior to start of field tests. All parts shall be sealed in plastic bags and delivered to the site in a heavy duty plastic storage bag. Bag shall be clearly labeled with part name & number and the corresponding equipment tagname.

B. The Contractor shall make available any replacement parts that are not manufacturer's normal stock items for immediate service and repair of all the electrical & instrumentation equipment throughout the warranty period.

C. The following spare parts shall be provided to the City as part of this Contract:
   1. Ten (10) fuses for each type of fuse.
   2. Three (3) lamps for each type of removable indicating light.
   3. One (1) relay for each type of control, intrinsic safe and time delay relays with bases.

3.12 WARRANTY

A. The Contractor shall have a staff of experienced personnel available to provide service on 2 working days' notice during the warranty period. Such personnel shall be capable of fully testing and diagnosing the hardware, software and implementing corrective measures.

B. If the Contractor "fails to respond" in 2 working days, the City at its option will proceed to have the warranty work completed by other resources; the total cost for these other resources shall be reimbursed in full by the Contractor. "Fail to respond" shall be defined as: The Contractor has not shown a good faith effort and has not expended adequate resources to correct the problem. The use of other resources, as stated above, shall not change or relieve the Contractor from fulfilling the remainder of the warranty requirements.

C. The Contractor shall reimburse the City for all direct and indirect costs associated with City repairs.

D. The Contractor shall warrant all electrical and instrumentation equipment for a period of one (1) year from date of final acceptance. Standard published warranties of equipment which exceed the preceding specified length of time shall be honored by the manufacturer or supplier.

E. Prior to "final acceptance", the Contractor shall furnish to the City a listing of warranty information for all manufacturers of materials, instruments, and equipment used on the project. The listing shall include the following:
   1. Manufacturer's name, service contact person, phone number, and address.
   2. Material and equipment description, equipment number, part number, serial number, and model number.
   3. Manufacturer's warranty expiration date.

F. The Contractor shall provide all labor and material to troubleshoot, replace, or repair any hardware that fails or operates unpredictable and correct any software problems during the warranty period, at no additional cost to the City.

G. Each time the Supplier's repair person responds to a system malfunction during the warranty period, he or she must contact the designated City

maintenance supervisor for scheduling of the work, access to the jobsite, and permission to make repairs. Operation of facilities necessary to test equipment shall only be performed by or under the direction of the City Staff. The Engineer reserves the right at its sole discretion to deny operations requested by the Supplier. A written description of all warranty work performed shall be documented on a field service report to be given to City prior to the repair person leaving job site each day. This field service report shall detail and clearly state problem, corrective actions taken, additional work that needs to be done, data, repair person name and company.

3.13 FINAL ACCEPTANCE

A. Final acceptance will be given by the Engineer after the equipment has passed the "final acceptance trial period", each deficiency has been corrected, final documentation has been provided, and all the requirements of design documents have been fulfilled.

B. Upon completion of the project, prior to final acceptance, remove all temporary services, equipment, material, and wiring from the site.

C. At the end of the project, following the completion of all of the field tests, and prior to final acceptance, the Supplier shall:
   1. Remove all temporary services, equipment, material, and wiring from the site.
   2. Verify Service equipment has been legibly marked in field with the maximum available fault current per NEC 110.24 (A). Field marking shall include date the fault current calculation was performed and be weather & UV rated. Service equipment shall not be hand labeled.
   3. Two sets of all keys for locks supplied on this project. Submit each key with matching duplicate. Wire all keys for each lock securely together. Tag and plainly mark with lock number or equipment identification, and indicate physical location, such as panel or switch number.
   4. Verify that as-installed drawings, in reinforced clear plastic pockets, have been placed in all new or modified panels
   5. Resubmit all Electrical System Analysis studies with all calculations rerun, data and graphs updated to reflect as-left conditions. Provide new Arc Flash labels to reflect as-constructed equipment and as-left circuit breaker settings.
   6. Provide the following final documentation to the City:
      a. A listing of warranty information.
      b. Operations and Maintenance Manual – Each "operation and maintenance" manual shall be modified or supplemented by the Supplier to reflect all field changes and as-built conditions.
      c. Full size record drawings neatly marked accurately showing the information required herein

d. Four (4) USB drives with copies of all final documentation to reflect as-built conditions.
e. At least one set of manuals, all software, disks and required programming cables shall be turned over to the City's SCADA/Electrical division.

SECTION 26 05 00 - APPENDIX "A"

TEST FORMS

Index of Forms:

BILL OF MATERIAL

PROJECT: _____ **DATE** / /

LOCATION: _____ **PAGE** _____

SPECIFICATION SECTION	QTY	DESCRIPTION	MFG.	PART NUMBER	TAG No.

SCHEDULED TEST REQUEST FORM

COMPANY PERFORMING TEST: _____
TESTING PERSONNEL : _____ _____
PHONE NUMBER OF COMPANY: _____
TEST PROCEDURE SUBMITTAL: _____ APPROVED : ___/___/___
SCHEDULED TEST DATE : _____ DATE : ___/___/___

TIME	DESCRIPTION OF TEST
8:00	
9:00	
10:00	
11:00	
12:00	
13:00	
14:00	
15:00	
16:00	

NOTES:

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

POWER AND CONTROL CONDUCTOR TEST FORM

TEST FORM (TF1)

EQUIPMENT

NAME : _____ LOCATION : _____

CONDUCTOR NUMBER	INSULATION TESTS					
	PHASE TO GROUND			PHASE TO PHASE		
	A	B	C	AB	BC	CA

NOTES:

Record insulation test values in meg-ohms.

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

INSTRUMENTATION CONDUCTOR TEST FORM

TEST FORM (TF2)

EQUIPMENT

NAME : _____ LOCATION : _____

CONDUCTOR PAIR NUMBER	CONTINUITY TESTS		INSULATION TESTS		
	CONDUCTOR TO CONDUCTOR	CONDUCTOR TO SHIELD	CONDUCTOR TO CONDUCTOR	CONDUCTORS TO GROUND*	SHIELD TO GROUND

NOTES:

Record continuity test values in ohms.

record insulation test values in meg-ohms.

* With both conductors tied together

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

GROUNDING SYSTEM TEST FORM

TEST FORM (TF3)

FALL IN POTENTIAL TEST

MAIN GROUND LOCATION	APPLIED VOLTAGE V	MEASURED POINT 1 VOLTAGE	MEASURED POINT 2 VOLTAGE	MEASURED POINT 3 VOLTAGE	CALCULATED RESISTANCE OHMS

TWO POINTS TESTS

EQUIPMENT NAME	EQUIPMENT #	CIRCUIT #	APPLIED CURRENT	MEASURED VOLTAGE	CALCULATED RESISTANCE OHMS

NOTES:

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

VISUAL AND MECHANICAL INSPECTION FORM

TEST FORM (TF4)

EQUIPMENT

NAME : _____ LOCATION : _____

NAMEPLATE DATA

MFGR. :	_____	SERIES # :	_____
MODEL # :	_____	U.L. # :	_____
VOLTAGE :	_____	PHASE :	_____
AMPERAGE :	_____	SERVICE :	_____
BUS TYPE :	_____	BUS BRACING:	_____
VERT. BUS :	_____	HORZ. BUS :	_____
GND. BUS :	_____	NEU. BUS :	_____
ENCLOSURE :	_____		_____
	_____		_____

INSPECTION CHECK LIST

ENTER: A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

TIGHTEN ALL BOLTS AND SCREWS	_____
TIGHTEN ALL WIRING AND BUS CONNECTIONS	_____
VERIFY ALL BREAKERS AND FUSES HAVE PROPER RATING	_____
CHECK BUS BRACING AND CLEARANCE	_____
CHECK MAIN GROUNDING CONNECTION AND SIZE	_____
INSPECT GROUND BUS BONDING	_____
CHECK EQUIPMENT GROUNDS	_____
CHECK CONDUIT GROUNDS AND BUSHINGS	_____
INSPECT NEUTRAL BUS AND CONNECTIONS	_____
CHECK HEATERS AND THERMOSTATS	_____
CHECK VENTILATION AND FILTERS	_____
CHECK FOR BROKEN OR DAMAGED DEVICES	_____
CHECK DOOR AND PANEL ALIGNMENT	_____
INSPECT ANCHORAGE	_____
CHECK FOR PROPER CLEARANCES AND WORKING SPACE	_____
REMOVE ALL DIRT AND DUST ACCUMULATION	_____
INSPECT ALL PAINT SURFACES	_____
CHECK FOR PROPER WIRE COLOR CODES	_____
INSPECT ALL WIRING FOR WIRE LABELS	_____
CHECK FOR PROPER WIRE TERMINATIONS	_____
CHECK FOR PROPER WIRE SIZES	_____
INSPECT ALL DEVICES FOR NAMEPLATES	_____
CHECK IF DRAWINGS MATCH EQUIPMENT	_____
CHECK ACCURACY OF OPERATION & MAINTENANCE	_____
	_____

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

PANEL-BOARD TEST FORM

TEST FORM (TF5)

PANEL NAME: _____ LOCATION : _____

NAMEPLATE DATA

MFGR. :	_____	SERIES # :	_____
MODEL # :	_____	U.L. # :	_____
VOLTAGE :	_____	PHASE :	_____
AMPERAGE :	_____	SERVICE :	_____
BUS TYPE :	_____	BUS BRACING:	_____
VERT. BUS :	_____	HORZ. BUS :	_____
GND. BUS :	_____	NEU. BUS :	_____
ENCLOSURE :	_____	MAIN BKR :	_____

INSULATION RESISTANCE TESTS - MEGOHMS					
A-GND	B-GND	C-GND			

INSPECTION CHECK LIST

ENTER: A-ACCEPTABLE R-NEEDS REPAIR OR REPLACEMENT NA-NOT APPLICABLE

TIGHTEN ALL BOLTS AND SCREWS	_____
TIGHTEN ALL WIRING AND BUS CONNECTIONS	_____
VERIFY ALL BREAKERS AND FUSES HAVE PROPER RATING	_____
CHECK BUS BRACING AND CLEARANCE	_____
CHECK MAIN GROUNDING CONNECTION AND SIZE	_____
INSPECT GROUND BUS BONDING	_____
CHECK EQUIPMENT GROUNDS	_____
CHECK CONDUIT GROUNDS AND BUSHINGS	_____
INSPECT NEUTRAL BUS AND CONNECTIONS	_____
CHECK FOR BROKEN OR DAMAGED DEVICES	_____
CHECK DOOR AND PANEL ALIGNMENT	_____
INSPECT ANCHORAGE	_____
CHECK FOR PROPER CLEARANCES AND WORKING SPACE	_____
REMOVE ALL DIRT AND DUST ACCUMULATION	_____
INSPECT ALL PAINT SURFACES	_____
CHECK FOR PROPER WIRE COLOR CODES	_____
INSPECT ALL WIRING FOR WIRE LABELS	_____
CHECK FOR PROPER WIRE TERMINATIONS	_____
CHECK FOR PROPER WIRE SIZES	_____
INSPECT ALL DEVICES FOR PROPER LEGEND NAMEPLATES	_____
	_____

CALIBRATION TEST EQUIPMENT PART NO.	DATE CALIBRATED:

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

OPERATIONAL DEVICE CHECKS AND TESTS FORM

TEST FORM (TF6)

NAME : _____ LOCATION : _____

CUB. #	EQUIPMENT NAME	EQUIP #	LOCAL SITE DEVICE CHECKS AND TESTS							REMOTE SITE DEVICE CHECKS & TESTS		
			SELECTOR SWITCH	INDICATOR LIGHTS	PUSHBUTTON & LOS	METERING & INDICATORS	OVERLOAD RESET	INTERLOCKS & CONTROL	ALARM & STATUS	SELECTOR SWITCH	INDICATOR LIGHTS	PUSHBUTTON & LOS

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY : _____

NOTES:

PHASE ROTATION TEST FORM

TEST FORM (TF7)

EQUIPMENT NAME	EQUIPMENT #	CIRCUIT #	PHYSICAL PHASE LOCATION	PHASE COLOR CODE	MEASURED PHASE ROTATION

NOTES:
Use phase tester to verify all circuits and equipment have a clockwise A-B-C phase rotation.
Physical phase locations: Left to Right - LR or Top to Bottom - TB
Phase color codes: Brown, Orange, & Yellow -BOY
Black, Red, & Blue -BkRBe

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

BREAKER DEVICE TEST FORM

TEST FORM (TF9)

FEEDER : _____ LOCATION : _____
EQUIP NAME: _____ EQUIP # : _____
EQUIP H.P. : _____ EQUIP KVA : _____

MFGR. : _____ PART # : _____ FRAME # : _____
VOLTAGE : _____ INTERRUPT RATING : _____ CHARACTER CURVE: _____

CONTACT RESISTANCE TESTS - OHMS INSULATION RESISTANCE TESTS - MEGOHMS

PHASE A	PHASE B	PHASE C	A-GND	B-GND	C-GND

MFGR TRIP TIME @300% MIN : _____ BREAKER RATING / RANGE: _____
MFGR TRIP TIME @300% MAX: _____ FINAL BREAKER SETTING : _____
MFGR INST. PICKUP APMS:

TEST-CURRENT TESTS TRIP TIME IN SECONDS @ 300% AMPS			INSTANTANEOUS TRIP TEST - AMPS		
PHASE A	PHASE B	PHASE C	PHASE A	PHASE B	PHASE C

ADDITIONAL TESTS AND SETTING AS APPLICABLE

	PICKUP		DELAY-TIME		
FUNCTION	RANGE	SETTING	RANGE	SETTING	
LONG TIME					
SHORT TIME					
GROUND FLT.					

NOTES:

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

MOTOR TEST FORM

TEST FORM (TF10)

EQUIPMENT
NUMBER : _____ NAME : _____

NAMEPLATE DATA - FIELD RECORDED

MANUFACTURER	MODEL #	SERIAL #	FRAME #

H.P.	R.P.M	F.L.A	VOLTS	PHASE	FREQ.	P.F.	S.F.
CODE	N.E.M.A.	INSUL.	ENCLOSR.	DUTY	DESIGN		

INSULATION TESTS PHASE TO GROUND MEG-OHMS			MOTOR FRAME GROUNDING SYSTEM TEST			MOTOR HEATER	MOTOR THERMAL
			APPLIED	MEAS.	CALC.	MEAS.	TRIP
A	B	C	VOLTS	AMPS	OHMS	AMPS	TEST

MOTOR TESTS - MEASURED VALUES

AMPERAGE			VOLTAGE			POWER	
A	B	C	AB	BC	CA	FACTOR	WATTAGE

NOTES:
VOLTAGE, AMPERAGE, POWER FACTOR, & WATTAGE SHALL BE RECORDED WITH A TRUE RMS METER.

TESTED BY : _____ DATE : ____/____/____
WITNESSED BY: _____

FACTORY TEST
MCC/CONTROL PANEL CHECKOUT FORM (TF11)

Manufacturer: _____ **Location:** _____

Job No.: _____

Tel: _____ **Fax:** _____

MCC / Control Panel: _____ **TEST RESULT**

	Pass	Fail
OVERALL PANEL INSPECTION		
1. All front panel and back panel components mounted securely.....	☐	☐
2. All wiring terminated and labeled correctly.....	☐	☐
3. All components, wiring, and labeling accurately reflected on the drawings..	☐	☐
POWER-UP INSPECTION		
1. Voltage levels on load side of circuit breakers.....	☐	☐
2. Voltage levels at the DC terminals of the power supply.....	☐	☐
3. Voltage levels at the DC power distribution terminals.....	☐	☐
POWER DISTRIBUTION AND GENERAL COMPONENT TESTING		
1. Power distribution to the appropriate components.....	☐	☐
2. Operation of the ancillary components such as receptacles, work lights, etc.	☐	☐
CONTROL COMPONENTS CHECKS		
1. Operators (push buttons, selector switches, pilot lights).....	☐	☐
2. Inputs from External Sources.....	☐	☐
3. Outputs to External Sources.....	☐	☐
4. Relay Logic.....	☐	☐
5. PLC I/O and Program Verification.....	☐	☐
6. O/I Display Verification.....	☐	☐

Notes:

1. For relay logic checks, each rung of the elementary or loop diagram is to be highlighted in yellow as they are verified for correct control functions.
2. For PLC I/O and program verification, the control strategies shall be highlighted in yellow as each logic function is tested.

Tested by: _____ **Witnessed by:** _____

Date: _____

I/O POINT CHECKOUT TEST FORM

TEST FORM (TF13)

I/O TYPE : _____ LOCATION : _____

I/O POINT TAGNAME	I/O POINT ADDRESS	TEST INPUT VALUE %			DISPLAY VALUE %			PLC REGISTER VALUE	TEST RESULT FAIL OR PASS COMMENTS	DATE OF CORRECTIVE ACTION
		0	50	100	0	50	100			

NOTES:

TESTED BY : _____ DATE : ____/____/____

WITNESSED BY: _____

INSTRUMENTATION DATA SHEET AND CALIBRATION RECORD TEST FORM (TF14)

Component Description	Manufacturer	Location
	Name	Site
Component Tag Name	Model	Equip
	Serial #	

	Range	Unit
Indicator Range		
Input Range		
Output Range		

General Notes

1) Attach Calibration Curves for dp Flowmeters

2) Include mounting elevations for level Instruments

3) All entries within solid box to be typed in prior to start of test

Designed Calibration			Measured Calibration		
Input Signal	Output	Eng. Value	Input	Output	Comments

Notes

Tested by (Print Name) Witnessed by (Print Name)

Signature Signature

Date / / Date / /

SECTION 26 05 00 - APPENDIX "B"

DEVICE INDEX

SECTION 26 05 00 DEVICE INDEX

E-DWG	P&ID DWG	TAG	NO.	DESCRIPTION	TYPE	SPECIFICATION	MINIMUM NEMA RATING	SIZE	SP / RANGE	UNITS	DWG REF DET MOUNTING	NOTES AND ACCESSORIES	26 05 00 TEST FORM
E7	-	FE	400004	Flow Element	Mag	Existing	-	24"	-	-	-		-
E7	-	FIT	400004	Flow Element	Mag	Existing	-	-	-	-	-		-
E7	-	FE	400005	Flow Element	Mag	26 05 00-2.05.A	-	48"	-	-	E5-B	Route cable in conduit	-
E7	-	FIT	400005	Flow Element	Mag	26 05 00-2.05.A	-	-	-	-	E5-E	E5-D	TF-14
E7	I-2	FE	171	Flow Element	Mag	26 05 00-2.05.A	-	24"	-	-	E5-B		-
-	I-2	FI	172	Flow Indicator	Vane	26 05 00-2.05.B	-	-	0.52-5.2	SCFM	PANEL	E3-D	TF-14
-	I-2	FIT	171	Flow Indicating Transmitter	Mag	26 05 00-2.05.A	-	-	0-40000	GPM	PANEL		TF-14
-	I-2	FSL	172	Flow Indicator	Roto	26 05 00-2.05.B	-	-	0.99	SCFM	PANEL	E3-D	TF-14
-	I-2	LIT	151	Level Indicating Transmitter	Bubbler	26 05 00-2.05.B	-	-	0-20	FT	E3-D		TF-13
E7	I-2	LSHH	152	Level Switch	Float	26 05 00-2.05.C	-	-	74	ELEV	E5-C	See Civil Dwgs	TF-13
E7	I-2	MOV	101	Motor Operated Valve	Cone	33 12 16.22	4X	12"	480VAC	-	PIPE	Actuator 33 12 16.23	TF-14
E7	I-2	MOV	102	Motor Operated Valve	Knife	33 12 16.21	4X	12"	480VAC	-	PIPE	Actuator 33 12 16.23	TF-14

END OF SECTION 26 05 00

SECTION 26 05 73

POWER SYSTEM STUDIES

PART 1 GENERAL

1.01 SUBMITTALS

A. Provide the following submittals, per Section 26 05 01, for the entire electrical power system including the 208/120V distribution system:
   1. Short Circuit Study.
   2. Protective Device Coordination Study.
   3. Arc Flash Study.

B. Electrical System Studies shall be prepared, stamped and signed by a professional Electrical Engineer registered in the State of California and in accordance with IEEE 242, IEEE 399 ANSI/IEEE C37.13 and IEEE 519.

C. Exceptions / Clarifications
   1. Itemize all exceptions and clarifications to the Contract Documents in a letter (located in the front of the submittal) on company letterhead.
   2. Exceptions that are noted in the study, but not listed on the Exceptions/Clarifications letter, will be considered as non-responsive and not accepted as changes to the Contract Documents.
   3. All exceptions taken from the Drawings and specifications shall be documented with justifications. When noting the exception, list which Drawings or which Specification Subsection number the exception is taken.
   4. Clarification requests shall list which Drawing or Specification Subsection number the clarification is required for.

D. Provide two (2) DVDs at the completion of the project. One DVD will contain the as-built set of studies, reports, settings, etc. The other DVD will contain the original source format of input data used for the PC based computer software, including all SKM files used to create the studies. Provide all setup information used for the computer based study and report.

E. For each resubmittal, provide a copy of submittal comments and a separate letter, on Company letterhead, identifying how each submittal comment has been addressed in the resubmittal.

F. When submittals are provided in PDF format, utilize the “Bookmark” feature of the Adobe Acrobat and clearly bookmark locations in the report to locations identified in the Report’s Table of Contents. Bookmarks shall not be out of order; the English description shall match that listed in the Report’s Table of Contents.

1.02 SEQUENCING AND SCHEDULING

A. It is the responsibility of those performing the electrical system analysis to collect and field verify all data. This includes verifying existing electrical distribution and obtaining all data from the Utility Company, Generator supplier and vendors necessary for completing the requested studies. Utilize proposed load data for the Studies obtained from submittals, Utility Company, Generator manufacturers, field verifications, etc.

B. A complete Protective Device Coordination Study shall be submitted within 60 days after approval of Short Circuit Study.

C. At the completion of the project, all studies shall be resubmitted with all calculations rerun, data and graphs updated to reflect as-left conditions. Provide new Arc Flash labels to reflect as-constructed equipment and as-left circuit breaker settings.

D. When previous electrical system analysis studies are available and provided to the Contractor, it is the Contractor's responsibility to verify the accuracy of the data used and to update it to match existing conditions.

PART 2 MATERIALS

2.01 GENERAL

A. Equipment and component titles and numbers used in the Studies shall be identical to the equipment and component titles and numbers shown on the Drawings.

B. Perform Studies using PC based computer software. State program name and version (e.g. version 2.1) in report.

C. Perform complete fault calculations for Utility and generator sources. Equipment shall not be grouped as a single large load; they shall be treated as individual loads. When generators are incorporated into the system, develop two separate networks: one with utility only (no generator attached) and one with generator only (no utility attached)

D. Complete protective device coordination study listing all device settings shall be utilized during start-up of electrical equipment.

E. Provide unique page numbers for every sheet in all Studies. Unique page numbers to be manually placed by Study Company after printout if study report doesn't assign page numbers.

F. One line diagrams
   1. Shall be readable on 11" x 17" paper. One line diagrams shall be redrawn in AutoCAD on multiple sheets if necessary or as requested by Engineer.

2. Buses and branches shall have descriptive names matching one line diagram or existing system (i.e. not Bus-0084).
3. Automatic transfer switches (ATSs), Main Switchboards (MSBs), shall not have multiple node buses.
4. Primary and secondary for transformers, Variable Frequency Drives (VFDs), etc. shall be changed to node buses.

G. Multiple scenarios for the short circuit and arc flash reports shall be provided.
1. Maximum available fault current from utility transformer:
   a. One Study with all motor contribution.
   b. One Study with no motor contribution.
2. Minimum available fault current from utility transformer:
   a. One Study with all motor contribution.
   b. One Study with no motor contribution.
3. Nominal available fault current from utility transformer: (if only nominal fault current is provided by the Utility and not maximum/minimum available fault current)
   a. One Study with all motor contribution.
   b. One Study with no motor contribution.
4. Generator (when shown)
   a. One Study with all motor contribution.
   b. One Study with no motor contribution.
5. Do not combine networks when multiple sites are modeled.
6. All studies shall be repeated with the arc flash reduction switch enabled (where applicable).

2.02 SHORT CIRCUIT STUDY

A. Include the following in the short circuit study:
1. Cable impedances based on copper conductors.
2. Bus impedances based on copper bus bars.
3. Transformer impedances based on tolerances specified in ANSI C57.12.00.
4. Source date (i.e. cable lengths, sizes, and quantity, for all runs in study, listing of bus loads, etc.).
5. Utility data:
   a. Size of Utility transformer.
   b. Impedance of Utility transformer.
   c. Primary voltage of Utility transformer.
   d. Fault information on primary side of Utility transformer:
      1) Three phase bolted fault.
      2) X/R ratio (positive sequence).
      3) Line to ground fault.
      4) X/R ratio (zero sequence).

e. Protective relays (type & settings).

6. Voltage drop and current flow at each node and load in system.

B. Calculate Short Circuit interrupting duties for an assumed three-phase bolted fault and line-to-ground fault at each of the following locations:
   1. Power transformer's primary
   2. Main Switchboard.
   3. All Motor Control Centers (MCCs).
   4. All panelboards.
   5. All 480V, 3-phase motor and equipment loads.
   6. All 3-phase transformer secondaries.
   7. All 240/208V equipment.

C. Verify:
   1. Equipment and protective devices are applied within their ratings.
   2. Adequacy of switchboard, panelboard and MCC bus bars to withstand Short Circuit stresses.
   3. Adequacy of transformer windings to withstand Short Circuit stresses and over-current.
   4. Cable sizes for ability to withstand normal and fault load currents.

D. Provide the following in the Short Circuit study report:
   1. Calculation methods and assumptions.
   2. Input data.
   3. Short circuit data.
      a. Impedances.
      b. X to R ratios.
      c. Asymmetry factors.
      d. Motor contributions.
      e. Short Circuit kVA.
      f. Symmetrical and asymmetrical line-to-line and line-to-ground fault currents.
      g. Device evaluation including rating of equipment.
      h. Bus evaluation including rating of equipment.
      i. Source data, from Electric Utility Company. Include copy of correspondence with Utility Company indicating values used.
      j. Source data from Generator Supplier (where applicable). Include copy of Generator provided values used.
   4. Tabulations of calculated quantities.
   5. Results, conclusions, and recommendations.
   6. One line diagrams of distribution system.
   7. Impedance diagram showing the resistances and reactances for all cables of the distribution system.

2.03 PROTECTIVE DEVICE COORDINATION STUDY

A. Provide Protective Device Coordination drawings for each section of distribution system that includes the following:
   1. Graphically diagram displaying coordination time-current curves on conventional log-log curve sheets. Each time-current curve shall have a unique identifier label. This identifier shall be used in the tabulated settings spreadsheet and on the associated one-line diagram.
   2. Time-current curves shall include the following curves (minimum):
      a. Utility relays (phase & ground) and high voltage switchgear relays (phase and ground).
      b. All upstream protective devices and breakers.
      c. All mechanical overloads.
      d. All MCP breaker and associated motor or equipment load. Duplicates of the same sized protective device and motor size may be omitted (i.e., when there are 3 pumps for same application).
      e. All transformers and associated primary and secondary protection.
      f. Unique identifier for each protective device.
      g. Provide separate TCC for phase and ground curves.
      h. TCC for Ground curves shall include the transformer magnetizing inrush currents for all transformers downstream of the circuit breaker. Ground shall clear the inrush currents.
   3. One-line diagram that applies to specific portion of distribution system associated with time-current curves. One-line diagram shall include the following:
      a. Location of each device.
      b. Power and voltage ratings, primary and secondary transformers amperages.
      c. All significant circuit elements such as transformers, cables, breakers, fuses, relays, etc. with their corresponding amperage ratings.
      d. Tag of each branch and node (shall be the same tags used in short circuit study).
      e. Mechanical overload and contactor.
      f. English description, equipment name, HP, and full load amp rating of motors and other 3 phase loads.
      g. Terminate device characteristic curves at a point reflecting maximum fault current to which device is exposed as calculated in short circuit study.
   4. Time current curves shall be provided for all protective devices with adjustable settings.

B. Characteristics plotted on time current curves shall include:
   1. Protective current relays.

2. Fuses including manufacturer's minimum melts, total clearing, tolerance, and damage bands.
3. Circuit breaker trip devices, including manufacturer's tolerance bands.
4. Transformer full-load currents at 100% and 600%.
5. Motor and equipment full load currents. Motors fed from VFDs and Soft Starters shall have their starting curves adjusted according to inrush currents on the TCC. Motors on TCC shall show the DC offset for VFD and Soft Starter fed pumps.
6. Transformer magnetizing inrush currents.
7. Transformer damage curves.
8. ANSI transformer withstand parameters.
9. Fault currents.
10. Ground fault protective device settings.
11. Other electronic protective devices.

C. Provide the following recommended settings in spreadsheet format in the Protective Device Coordination study report:
   1. Relay settings including CT values.
   2. Circuit Breakers adjustments:
      a. Long Delay Pickup and Time.
      b. Short Time Pickup and Time.
      c. Instantaneous Pickup and Time.
      d. Ground Pickup and Time.
   3. Programmable settings for all electronic devices. Settings for non-current relay settings shall also be provided.
   4. Settings shall be given both in amps and seconds as well as the corresponding physical setting (i.e. 30A and setting B on MCP) for device.
   5. Identify protective device associated with each curve by manufacturer type, function and part number.

2.04 ARC FLASH HAZARD STUDY

A. General:
   1. Arc flash boundary and incident energy shall be calculated using a PC computer program at all significant locations in the electrical network, including switchgears, switchboards, MCCs, transformers, and other major equipment where work could be performed on energized equipment.
   2. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.
   3. Document method of calculation.
   4. Do not include the motor contribution of motors fed by VFDs in the arc flash hazard study.

B. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm2.

C. Study shall include the following:
   1. All significant locations in 480 volt, 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA.
   2. Incident energy and flash protection boundary calculations in spreadsheet format in the Arc Flash Hazard study report.
   3. Provide the following incident energy and flash protection boundary calculations in spreadsheet format in the Arc Flash Hazard study report (values shall be calculated for all electrical equipment in the power distribution system):
      a. Arcing fault magnitude
      b. Device clearing time
      c. Duration of arc
      d. Boundary for:
         1) Arc flash limited shock approach
         2) Limited shock approach
         3) Restricted shock approach
      e. Working distance
      f. Incident energy at 18 inches (in cal/sq.-cm)
      g. Recommendations for arc flash energy reduction for each location having more than 8 cal/sq.-cm. Provide preliminary cost estimate for implementing recommendations.
      h. Provide separate spreadsheets for all scenarios listed in subsection 2.01.G. Do not combine the spreadsheet values nor only provide the worst case scenario. Clearly list on each spreadsheet the English description of the Scenario presented.
   4. Provide recommendations for the Personal Protective Equipment (PPE) that the Engineer should maintain on site for the level of hazard.
   5. Provide recommendations for safety label design that should be posted on electrical equipment.

2.05 STUDY REPORTS

A. Written reports submitted for approval shall contain:
   1. Scope of Studies performed.
   2. Explanation of bus and branch numbering system.
   3. Report calculations, tabulations and spreadsheets.
   4. Selected equipment deficiencies.
   5. Results of Studies.
   6. Comments, recommendations or suggestions regarding:
      a. Changes and additions to equipment rating and/or characteristics.

b. Circuit protective devices improperly rated for overload or fault conditions.
c. Arc Flash protective equipment and safety labels.

7. Tabulation spreadsheet for all protective device settings with the following column entries (minimum):

Device Code	Desc.	MFR	Type	Plug Trip	Frame	KAIC	Long Time		Short Time		Inst	Ground	
							Amps	Time	Amps	Time	Amps	Amps	Time

8. Stamped, signed and dated by Electrical Engineer registered in the State of California who performed the analysis.

B. Reports are to be updated to reflect as-built conditions and placed in O&M manual, per Section 26 01 00 requirements.

PART 3 EXECUTION

3.01 GENERAL

A. Make minor modifications to equipment settings as required to accomplish conformance with the Short Circuit and Arc Flash Studies.

B. Notify Engineer in writing of any required major equipment modifications.

3.02 FIELD TESTS

A. Provide field testing of protective equipment.

B. Adjust relay and protective device settings according to values established by Coordination Study.

3.03 ARC FLASH WARNING LABELS

A. All Arc Flash warning labels shall meet NEC requirements, OSHA standards and NFPA recommendations.

B. Provide and install 4 in. x 6 in. thermal transfer type labels of high adhesion polyester for each work location analyzed and as required by the NEC for flash protection on power distribution equipment.

C. Each label shall have an orange header with the wording, “WARNING, ARC FLASH HAZARD,” and shall include the following machine printed information:

1. Location Designation
2. Nominal system voltage
3. Arc Flash boundary
4. Available incident energy and working distance (in inches)
5. Minimum arc rating of clothing
6. Site specific level of PPE

7. Engineering report number, revision number and issue date
8. Company preparing report and contact phone number.

D. Labels shall not be hand labeled.

E. For all areas, Contractor shall post the following:
   1. Working distances
   2. Shock hazard voltage
   3. Shock Approach Boundaries:
      a. Limited
      b. Restricted

F. Provide Arc Flash labels for the each of the following pieces of equipment:
   1. 480V and applicable 208V panelboards
   2. MCCs
   3. Switchboard
   4. Switchgears
   5. Control Panels
   6. All electrical equipment with an incident energy level greater than 1.2 Cal/cm2.
   7. Where Switchgear, Switchboard, MCC, Panelboard, Distribution Panel, etc. feed multiple circuit breakers from the enclosure, provide separate line and load side Arc Flash Labels for the Main Circuit Breaker.
   8. Provide separate labels at each circuit breaker that has arc flash reduction switches indicating the appropriate values when the switch is enabled.

G. Labels shall be submitted for approval. No labels shall be installed without prior approval by Engineer or City.

3.04 ARC FLASH TRAINING

A. The Supplier shall train City personnel of the potential arc flash hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures shall be in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces and shall be provided in the equipment manuals.

END OF SECTION

SECTION 31 10 00

SITE PREPARATION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing all labor, materials, equipment, tools and incidentals and performing all operations necessary to prepare the Site for excavation, backfill and related construction activities.

B. Site preparation shall include clearing, grubbing, stripping and disposal of objectionable material within the Site area where grading is proposed as indicated on the Project Plans. Where used in this section, objectionable material is defined as trash, rubbish and junk; lumber, sheet metal, concrete and oversize rubble; and trees, stumps, roots, brush, and other organic matter, whether alive, dead or decaying.

1.02 PROTECTION

A. Adequate protection measures shall be provided to protect workers and visitors at the Site. Adjacent property shall be fully protected throughout the operations.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the Site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in or near the construction site.

D. Access streets shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.

E. Surface drainage provisions shall be made during the period of construction in a manner to avoid creating a nuisance to adjacent areas.

F. The Site and adjacent influenced areas shall be watered as required to suppress dust nuisance and for uniform compaction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CLEARING

A. Clearing shall consist of removal of interfering or objectionable material lying on or protruding above the ground surface from the Site as shown on the Project Plans.

3.02 STRIPPING

A. After clearing and grubbing, the Site areas designated for excavation shall be stripped to a depth necessary to remove all objectionable material below the existing ground surface. The organic or unsuitable materials shall be removed to expose a firm surface of undisturbed embankment materials.

B. The strippings shall be placed along the interior toe of the pond at a location and as directed by the Engineer.

C. The strippings shall be spread, graded, and compacted to a minimum of 85% relative compaction by track or wheel rolling to a surface profile that will not cause water to pond.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing all labor, materials, equipment, tools, and incidentals and performing all operations necessary to perform the following:

1. Excavate, and/or over-excavate if needed earth and rock, regardless of character and subsurface condition
2. Prepare foundation and subgrade materials for the construction of concrete structures or the placement of fill material thereon
3. Import suitable soil materials as required
4. Mix, blend and moisture condition materials as required
5. Remove and replace unsuitable materials
6. Dewater or otherwise control and remove groundwater
7. Dispose of surplus excavated material on site at locations designated by the Engineer.

1.02 RELATED SECTIONS

A. Section 31 10 00 – Site Preparation

B. Section 31 23 19 – Dewatering

C. Section 31 23 25 – Controlled Density Fill

D. Section 31 41 00 – Shoring and Bracing

E. Section 32 15 40 – Crushed Stone (Shale) Surfacing

1.03 DEFINITIONS

A. Whenever used in this Section or in the Project Plans, the following terms shall have the primary meaning given herein:

1. Excavation – Removal of native materials below the plane established by the stripping operations to the lines and grades shown on the Project Plans from those areas upon which fill materials will be placed or as directed by the Engineer.
2. Fill or Embankment Fill – Suitable materials meeting the requirements and handled in accordance with these contract documents.

3. Over excavation – Unforeseen removal of native materials beyond the limits of excavation shown on the Project Plans as indicated and directed by the Engineer.
4. Suitable material – Material which meets the requirements for fill or embankment fill as described in this Section.

1.04 PROTECTION

A. Adequate protection measures shall be provided to protect workmen and passers-by at the site. Streets and adjacent property shall be fully protected throughout the operations.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.

C. Any construction review of the Contractor's performance conducted by the Engineer is not intended to include review of the adequacy of the Contractor's safety measures in, or near the construction site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill materials shall be of approved on-site materials from required excavations. Approved on-site materials are defined as local soils free of rubble, rubbish and vegetation.

B. Fill shall conform to the following requirements:

1. Plasticity Index of greater than 8 and less than 20.
2. The percentage composition by weight of the soil materials shall conform to the following gradation:

Sieve size (U.S. Standard)	Percent passing (By Dry Weight)
1-1/2" (See Subsection C)	100
3/4"	75–100
No. 4	50–100
No. 40	40–80
No. 100	30-60
No. 200	10–50

C. All fill materials must be approved by the Engineer prior to use. The maximum dimension of rock fragments and lumps shall be 4 inches, provided that any such fragments are isolated and fully surrounded by fine-grained material. Rock fragments and lumps larger than 1-1/2 inches shall be approved by the Engineer in the field prior to incorporation into the fill.

D. Material containing brush, roots and other organic matter or otherwise deleterious material is not considered suitable for placement as fill and shall be disposed of as directed by the Engineer.

E. Off-site import material shall meet the requirements of Fill as described above.

F. Imported material, if required, shall be approved by the Engineer prior to use. All imported material that does not originate from a commercial material supplier is subject to the following requirements:

1. Situs property of material shall have no recordation of impact to groundwater as documented through the California State Water Resources Control Board website: http://geotracker.waterboards.ca.gov/
2. Subject to the Item No. 1, chemical analysis maybe required of the material, at the City's cost, to verify the following:
   a. Import material shall have no presence of Gasoline Range Organics (GRO), Diesel Range Organics (DRO), Hexane Extractable Matter (HEM), Volatile Organic Compounds (VOCs) including MtBE, Semi Volatile Organic Compounds (SVOCs), Polychlorinated Biphynols (PCBs) above the laboratory method reporting limits established by a California State-certified laboratory for chemical analysis.
   b. Import material shall have no presence of various (ICAP) Metals including Cadmium, Chromium, Lead, Nickel, and Zinc above background concentrations.

PART 3 EXECUTION

3.01 GENERAL

A. All moisture conditioning, including blending, shall be perform on the borrow source or stockpile. Only minor adjustment will be allowed during placement and compaction of the material.

B. After being properly mixed and moisture conditioned, the materials removed from excavations areas are generally considered suitable for use in constructing the proposed fills indicated on the Project Plans.

C. The Contractor shall give a minimum of 72 business hours notice to the Engineer and DSOD prior to commencing or recommencing any earthwork operations; additional time may be required for review/testing of materials proposed for placement. No materials shall be placed prior to favorable field review of subgrade or previously graded surface by the Engineer and DSOD.

D. Preparation of subgrade and placement of materials shall be observed by the Engineer so that a professional opinion can be rendered as to the conformance of the completed fill to the specifications.

3.02 LAYOUT AND PREPARATION

A. The Contractor shall lay out all work, establish grades, locate existing underground utilities, set markers and stakes, set up and maintain barricades and protect all utilities prior to beginning actual earthwork operations.

B. Excavation shall begin only after, site preparation and stripping of organic materials.

3.03 EXCAVATION

A. Excavation shall extend downward from the existing ground surface to remove in-situ soils in their entirety as required to construct the proposed improvements. The excavation depth shall be as shown on the Project Plans or at the discretion of the Engineer.

B. When completed, the average plane of excavation slopes shall conform to the lines and grades shown on the Project Plans and no point on the completed slopes shall vary from these designated slopes by more than 0.5 feet measured at right angles to the slope.

C. All cut slopes shall be periodically examined during and at the completion of excavation by the Engineer and DSOD who shall evaluate the excavated soils and determine the need for additional excavation beyond plan finished grade.

D. Should unstable or permeable areas of the cut be exposed during excavation, they shall be removed by over excavating as directed by the Engineer. Any

granular pocket(s) shall be over-excavated and replaced with controlled density fill conforming to the requirements of Section 31 23 25 as directed by the Engineer.

E. Excavation beyond the limits indicated, unless approved by the Engineer, will be at the Contractor's expense.

F. Any material excavated from trenches in the project area that are discovered during construction to exhibit signs of contamination (including, but not limited to staining and/or odor) shall be considered property of the City and shall only be disposed of at the direction of the City. Under such conditions, costs beyond normal disposal costs for uncontaminated material will be paid on a force account basis. Prior to disposal of any excess material from the work site, the Contractor shall submit to the Engineer written authorization for such disposal and entry permission signed by the approved disposal site. Contractor shall comply with all disposal regulations such as City, County, and/or State permits and licenses, as may be required.

3.04 FOUNDATION PREPARATION

A. The soils exposed by the excavation or areas where fill will be placed shall be scarified to a depth of at least 6-inches, moisture conditioned to, and maintained at, a uniform moisture content of 0% to +3% above optimum while fill is being placed.

B. Optimum moisture content shall be determined during soil tests of proposed fill material.

C. The compacted foundation surface shall have an in-place field density equal to the field density of the compacted fill proposed to be placed thereon.

3.05 PLACING AND RECOMPACTING FILL MATERIAL

A. Embankment fill placed within the outer top of embankment grade break shall be moisture conditioned to within a range of 0% to +3% of the optimum moisture content to achieve an average 95% relative compaction per ASTM D1557, with no single test less than 93%. Optimum moisture content to be determined following soil tests of proposed fill.

B. Miscellaneous fill placed beyond the outer top of embankment grade break shall be moisture conditions to within a range of 0% to +3% of the optimum moisture content to achieve a minimum average 90% relative compaction per ASTM D1557.

C. Fill should be placed in 8-inch loose lifts and compacted with a minimum of 8 passes with equipment meeting the requirements of Part 3.06 below. Where hand compaction work is required, fill should be placed in 4-inch loose lifts with hand compactors and compacted with a minimum of 8 passes.

D. On-site soils available for use as fill are frequently saturated and drying will likely be necessary to achieve specified moisture content before placement.

E. Water may be sprinkled on the embankment if necessary. If, in the opinion of the Engineer, the top or contact surfaces of a fill section become too dry or smooth to permit suitable bond between these surfaces and the additional fill to be placed thereon, it shall be moistened and/or worked with a harrow, scarifier, disc, sheeps-foot roller, or other suitable equipment in an approved manner to a sufficient depth to provide satisfactory bonding before the next succeeding layer of earth fill material is placed.

F. Structure Backfill Placement

1. Backfill against structures shall not be placed until the structure footings or other portions of the structural facility have been inspected by the Engineer.
2. No backfill material shall be deposited against concrete before 7 days, or until the concrete has either developed a strength of not less than 3,000 pounds per square inch in compression as determined by test cylinders, or attained sufficient strength to withstand the loads imposed as directed by the Engineer.
3. Backfill within the vicinity and against structures shall be placed and compacted in/ horizontal, uniform loose lifts not exceeding 4-inches in depth, shall be compacted using hand held or walk-behind compactors, and shall be brought up uniformly on all sides of the structure or facility.
4. Compaction of structure backfill by ponding or jetting will not be permitted. Compaction of material placed within 2 feet of concrete structures shall be attained using hand-held tampers only.

3.06 COMPACTION EQUIPMENT

A. Compaction shall be completed by a sheepsfoot or pad type roller. Roller drums shall be no less than 60-inches in diameter, not less than 60-inches in length, and not weigh less than 4,000 pounds per linear foot of drum length.

B. Material placement shall not exceed the rated capacity of the compaction equipment.

C. Total weight of individual pieces of compaction equipment shall not be less than 37,500 pounds.

D. All compaction equipment shall be approved by the Engineer prior to use.

3.07 FILL TEST METHODS AND REQUIREMENTS

A. Moisture content and compaction testing shall be made in conformance with ASTM D 1557.

B. All soil evaluations and tests shall be performed by the Engineer. Tests shall be for the purpose of determining compliance with these Specifications and the frequency and locations of tests shall be at the discretion of the Engineer. The Contractor may conduct independent tests for his convenience and control purposes at his sole expense; however, such tests will not be recognized for the purpose of establishing compliance with Specification requirements.

C. Record density and field density tests will be made throughout the fill for quality assurance and quality control of the compaction and permeability.

1. Record density tests shall be taken by the Sand Cone Method per ASTM D 1556.
   a. A minimum of one record density tests shall be taken per shift throughout the fill in locations specified by the Engineer.
2. Field density tests may be taken by the Nuclear Method per ASTM D 6938 by the Engineer for quality control purposes.
   a. A minimum of two field density tests will be taken for every 2 feet of vertical fill placed in locations specified by the Engineer.
3. A field density test shall be taken adjacent to the location of any record density test for correlation purposes.

D. When a density test, or group of tests, indicates that the specified compaction has not been achieved, that portion of the fill shall be reworked until the required density has been attained. Rework may require additional moisture conditioning and compaction or complete removal and replacement.

3.08 FINISHING AND TOLERANCES

A. Fill slopes shall be overfilled by a minimum of 0.5 feet and then trimmed back to a dense, uniform surface at the final grade. All loose material shall be removed from the slopes and excess spread on the bottom of the pond. When completed, the average plane of the slope shall conform to the slopes shown on the Project Plans and no point on the completed slopes shall vary from these designated slopes more than 0.5 ft measured at right angles to the slope.

B. Finished grade surfaces shall be maintained to the grades and cross sections shown on the Project Plans until final acceptance of the Contract.

C. If work has been interrupted by weather, scheduling, or for any other reason, the Engineer shall be notified by the Contractor at least 24 hours prior to the intended resumption of grading. It may be necessary to re-affirm suitability of placed compacted fill soils or fill materials that have been exposed to adverse weather conditions.

3.09 UNUSED MATERIAL

A. Unused and unsuitable material shall be uniformly spread and graded along the interior toe of the pond at a location and as directed by the Engineer.

B. Material shall be compacted to a minimum 85% relative compaction.

C. Material shall be placed as directed by the Engineer and spread at a maximum slope of 2% with a finished thickness not greater than 6-inches.

D. Material placed on the pond bottom shall be graded to a surface profile that will not cause water to puddle or pond and promotes drainage towards the existing pump station.

E. No earthen material shall be removed from the site.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Installation and maintenance of dewatering systems. Handling and disposal of excess pond water and water encountering and entering excavations or other parts of the work.

1.02 RELATED SECTIONS:

A. Section 01 33 00 – Submittals

B. Section 31 23 00 – Excavation and Fill

C. Section 31 41 00 – Shoring and Bracing

D. Reference Document: Geotechnical Report (by others) is available, as noted in Section 31 23 00.

1.03 SUBMITTALS

A. A dewatering plan for each occurrence shall be approved by the Engineer and DSOD prior to implementation.

B. Dewatering Plan Requirements:

1. Submit design and shop drawings prepared, stamped, and signed by a Professional Civil Engineer registered in the State of California.
2. The dewatering water conveyance system shall be detailed.
3. Detail of how sediment removal will occur.
4. The analysis shall include an evaluation of the anticipated subsurface conditions.
5. Dewatering analysis and design shall be fully coordinated with excavation and shoring design. The shoring and excavation design shall recognize the changes in groundwater conditions and earth pressures.

1.04 GENERAL

A. The Contractor shall comply with all City, County, and State permit and license requirements.

1. The Contractor shall obtain a dewatering permit from the County if necessary.

1.05 SITE CONDITIONS

A. The Ponds will be lowered and taken out of service in accordance and in the sequencing information indicated in Section 01 35 13 – Part 1.04.

B. Groundwater may be encountered during the course of excavation. If it is encountered, the Contractor shall immediately notify the Engineer.

C. The proposed project is located in an area that contains no **known** subsurface petroleum hydrocarbon contamination.

D. The contractor shall maintain awareness of potential signs of soil and groundwater contamination throughout the project limits and shall notify the City immediately upon discovery. Conditions indicative of contamination may be either visual (staining in soil, sheen on water surface) or olfactory (petroleum hydrocarbon odors.)

E. Upon the discovery of suspected contaminated materials, the Contractor shall immediately provide 40 hour OSHA-HAZWOPER certified workers in the contaminated area. The Contractor shall also provide a field Site Safety Officer that is also an 8-hour OSHA-HAZWOPER Supervisor trained to directly oversee the contaminated materials removal and handling operation. All workers in this circumstance must have their initial and annual renewal refresher training, medical clearance and personal protection equipment in accordance with 8CCR Section 5192.

F. Lower static water and dewater excavations, as required, to process and compact subgrade in accordance with Section 31 23 00 – Excavation and Fill.

G. Do not place concrete or masonry footings, foundations, or floors in water, nor allow water to rise over them until concrete or mortar has set at least 24 hours.

H. Maintain operation of the dewatering system until the complete structure including walls, slabs, beams, struts, and all other structural elements has attained specified strength, and backfill has been completed to 3 feet above the normal static groundwater level.

I. Prior to release of groundwater to its static level, all pressure relief devices shall be fully operational.

J. Release of groundwater to its static level shall be controlled to prevent disturbance of the natural foundation soils or compacted fill and to prevent flotation or movement of structures or pipelines.

1.06 SEQUENCING AND SCHEDULING

A. Locate dewatering facilities where they will not interfere with utilities and construction work to be performed on the site.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Excess pond water and water accumulated in excavations may be discharged into the pond bottom where it will not impact the proposed work.

B. Sediment shall be removed from water discharged into the pond by a placing the pump inlet hose into a sump filled with clean gravel or a perforated bucket filled with clean gravel. The outlet of the pump shall have a filter sock installed to retain residual sediment.

C. No water from dewatering operations shall be released to, or drain to a creek, wetland, channel, drainage feature, storm drain, or waters of the state.

D. No water from dewatering operations shall be disposed of in a manner as to cause injury to public or private property, or be a menace to public health.

E. Do not drain water into work built or under construction, except as noted.

3.02 CONTAMINATION

A. The discharge shall be monitored to verify the lack of contamination. **If any odor, sheen or other visual discrepancy is noted during excavation or discharge, stop pumping and immediately notify the Engineer**.

3.03 INSTALLATION

A. Contractor shall be responsible for constructing, operating and maintaining all necessary features to complete the work including furnishing, installing and maintaining all pumping and other equipment required to dewater the remaining pond water and any trenches containing water that may be encountered during performance of the work. Dewatering plan for each occurrence shall be approved by the Engineer prior to implementation. At the permanent conclusion of dewatering operations, all dewatering equipment shall be removed from the job site.

B. The Contractor shall have a minimum of two working pumps available for immediate use at all times. The amount and size of pumps onsite shall be adequate to keep ahead of demand, with adequate backup.

C. There is no electric utility at the project site. The Contractor shall provide a power generator capable of supplying power to all dewatering pumps. Contractor shall be able to respond and reach the site within one hour (anytime of the day) to activate the generator.

D. Intercept and divert precipitation and surface water away from excavations through the use of dikes, curb walls, ditches pipes, sumps, or other means.

E. Runoff is prohibited during dewatering to ensure that sediment is not transported from the immediate work area, and that the operation does not result in erosion.

3.04 CLEANUP

A. At the permanent conclusion of dewatering operations, all dewatering equipment shall be removed from the job site.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

1. Trenching and other excavation needed for the installation of pipe and appurtenances.
2. Preparation of trench subgrades for the placement of bedding and utilities.
3. Procurement, placement, compaction and finishing of trench backfill materials.

1.02 RELATED SECTIONS

A. Section 31 23 00 – Excavation and Fill

B. Section 31 23 19 – Dewatering

C. Section 32 11 23 – Aggregate Base

D. Section 33 10 05 – Basis Piping Materials and Methods

1.03 SUBMITTALS

A. Provide submittals for sand equivalent and gradation analysis of bedding and backfill materials.

PART 2 PRODUCTS

2.01 BEDDING MATERIAL (NON-EMBANKMENT AREAS ONLY)

A. Bedding material shall be used as pipe bedding for the portion of the pipeline outside the footprint (beyond the toe) of the embankment.

B. Bedding material shall be free from organic matter and refuse.

C. The minimum sand equivalent shall be 30.

D. The grading shall conform to the following:

Sieve Sizes	Percentage Passing (By Weight)
3/4”	100
3/8”	80-100
No. 4	10-50
No. 16	5-30
No. 200	0-4

E. Sand may be used at the Contractor’s option.

2.02 BACKFILL MATERIALS

A. Backfill material shall be as shown on the Project Plans for the trench type shown.

B. Where backfill is shown as being suitable native backfill, it shall meet the requirements of Section 31 23 00 – Excavation and Fill for Fill.

C. Class 2 Aggregate base shall conform to the requirements of Section 32 11 23 – Aggregate Base.

D. Within the embankment footprint, full reinforced concrete encasement is required for pipe backfill.

E. Fill placement and compaction over the pipe concrete encasement outside of the embankment footprint shall be accomplished with a light hand-help compactor for at least three feet above pipe crown before compacting with heavy equipment.

PART 3 EXECUTION

3.01 EXCAVATION

A. The Contractor shall make all necessary excavations to construct the work shown on the Project Plans and in accordance with trench detail appropriate to the utility being installed.

B. The Contractor shall perform all excavations of every description and all substances encountered to the depth indicated on the Drawings.

C. During excavation, that material suitable for backfilling shall be deposited in an orderly manner a sufficient distance from the banks for the trench to avoid overloading and to prevent slides or cave-ins.

D. All surplus and unsuitable excavated material shall be disposed of as indicated in Section 31 23 00 – Excavation and Fill.

E. Excavation shall include the removal of all materials or surface obstructions of any nature that would interfere with the execution of the work, and their replacement to equivalent preconstruction condition after installation of utilities.

3.02 TRENCH WIDTH AND DEPTH

A. The trench shall be excavated to the dimensions and depth shown on the Project Plans and in a manner which will produce a firm foundation for supporting the entire length of each section of pipe.

3.03 CONTROL OF WATER

A. See Section 31 23 19 – Dewatering for additional information.

3.04 PIPE BEDDING

A. Bedding shall not be used where the pipe is encased in a concrete cradle as indicated on the Project Plans.

B. Bedding material shall be placed under the pipe before the pipe joints have been completed and inspected.

C. Bedding material shall be placed carefully around and under the pipe in horizontal layers 4 inches thick after compaction.

D. The bedding material shall be brought up uniformly on each side of the pipe.

E. Bedding material shall have the proper moisture content to assure maximum compaction by using hand or pneumatic tampers.

F. Bedding shall be accomplished in a manner which will not disturb the pipe but will secure a relative compaction of not less than 90% relative compaction per ASTM D1557 unless otherwise specified.

G. Bedding shall be installed up to 12 inches over the top of the pipe or as shown on the Project Plans.

3.05 TRENCH BACKFILL

A. Backfill material shall be placed after the pipe and bedding have been inspected by the Engineer.

B. Bedding and backfill material shall be approved by DSOD prior to placement.

C. Suitable Native Fill and Class 2 Aggregate Based used as trench backfill shall be placed and compacted as follows:

1. Spread in uniform layers not exceeding 6-inches compacted thickness.
2. Moisture conditions and mixed as necessary to obtain a moisture content of 2 percent over-optimum (4 percent for expansive soils).
3. Compacted to not less than 90% relative compaction per ASTM D1557 unless otherwise specified or indicated on the Project Plans.
   a. Compaction within 6 inches of paved subgrade or footings shall be to at least 95%.
4. Compaction of trench backfill material by ponding or jetting will not be permitted.

3.06 CLEAN UP

A. Remove all debris and stains resulting from the work of this section.

END OF SECTION

SECTION 31 23 25

CONTROLLED DENSITY FILL

PART 1 GENERAL

1.01 SUMMARY

A. Section includes furnishing and installing controlled density fill (CDF) as trench bedding and backfill.

1.02 RELATED SECTIONS

A. Section 01 33 00 Submittals

B. Section 31 23 00 – Excavation and Fill

C. Section 31 41 00 – Shoring and Bracing

D. Section 33 10 05– Basic Piping Materials and Methods

1.03 DEFINITION

A. Controlled Density Fill (CDF) shall be a flowable, nonsegregating, self-consolidating, low shrink slurry with an unconfined compressive strength at 28 days of between 50 and 150 psi, per ASTM D4832.

1.04 SUBMITTALS

A. Product Data

B. Mix Design:

1. Mix designs shall prepared for the entire range of aggregate gradations that are expected to be used. The Contractor shall determine the materials and proportions to meet the requirements of these Specifications and make daily checks of the aggregate gradation and adjust the mix design as necessary to meet these Specifications. The CDF mix design shall be modified as necessary for each individual pour.
2. The Engineer's acceptance of the mix design shall be understood to indicate conditional acceptance. Final acceptance shall be based on tests conducted on field samples verifying conformance with these Specifications.

PART 2 PRODUCTS

2.01 CDF MATERIALS

A. CDF shall be a mixture of Portland cement, fly ash, aggregates, water, and admixtures which has been batched and mixed in accordance with ASTM C94.
   1. Portland cement shall conform to ASTM C150, Type I or Type II.
   2. Fly ash shall be Class F or Class C.
   3. Aggregates shall conform to ASTM C33.
   4. Admixtures shall conform to ASTM C260, ASTM C494, or AASHTO M194.

PART 3 EXECUTION

3.01 DELIVERY AND INSTALLATION

A. Measuring, mixing, delivery, and placement of controlled density fill shall be in accordance with ASTM C94.
   1. CDF shall be prepared at a ready mix plant.

B. CDF shall be brought up uniformly to the elevation shown on the drawings, and shall completely fill the area designated without voids.

C. Each filling stage shall be as continuous an operation as practicable.

D. Do not perform any vibratory consolidation or compaction.

E. CDF shall have a temperature of at least 40 degrees F at the time of placement, and shall not be placed when either ground or ambient air temperatures are less than 38 degrees F.

F. Traffic shall not be allowed over CDF for at least 24 hours after placement or until CDF is compacted or hardened to prevent rutting by construction equipment or traffic, whichever is later.

END OF SECTION

SECTION 31 25 13

EROSION CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Erosion controls shall include preparation and implementation of a SWPPP, furnishing all labor, materials, equipment, tools, and incidentals and performing all operations to conduct erosion control responsibilities during construction and prior to final acceptance.

B. Water Pollution Control shall be performed in accordance with Section 13-3, Stormwater Pollution Prevention Plan of the Standard Specifications and Section 31 25 13 – Erosion Controls of these technical specifications. In addition, construction activities shall comply with:

1. The current California Water Quality Control Board, North Coast Region Order No. R1-2015-0030, National Pollutant Discharge Elimination System Municipal Storm Water Permit, commonly referred to as the "Storm Water Permit". A copy of the Storm Water Permit is available for review at the City of Santa Rosa Transportation and Public Works Department, 69 Stony Circle, Santa Rosa, CA, and at www.srcity.org/stormwaterpermit.
2. The California Stormwater Quality Association Storm Water BMP Handbook for Construction (CASQA Handbook). BMPs shall be selected, installed and maintained in accordance with the latest edition. A copy of the handbook can be viewed at the City of Santa Rosa Department of Transportation and Public Works office at 69 Stony Circle or downloaded from CASQA, http://www.casqa.org/.

1.02 SUBMITTALS

A. Storm Water Pollution Prevention Plan (SWPPP)

1. The Contractor shall be responsible having a SWPP prepared by a QSD and submitting the plan to the Engineer for review and approval within 14 days of the Notice to Proceed.
2. The Contractor shall keep a copy of the plan at the jobsite at all times and make the plan available to the City, Engineer and State of California Representatives for their use.
3. The Contractor shall comply with all terms of the SWPP in a timely fashion and with no additional compensation therefor.
4. The SWPP shall include as a standard compliance reference the latest edition of the California Stormwater Quality Associates Stormwater Best Management Practices Handbook.

5. The Contractor shall complete and sign the Storm Water Correction Site Inspection form with the City as part of the SWPPP. A copy of the form is available upon request.
6. The SWPPP shall include but not be limited to specific references to management practices required to operate the erosion control plan included in the project drawings.
    a. Dewatering
    b. Construction near water courses
    c. Material used and storage
    d. Excavation
    e. Sediment Control
    f. Trenching
    g. Temporary stockpiling of trench spoils and earthen materials

1.03 RELATED SECTIONS

A. Section 01 35 13 – Special Project Procedures

B. Section 01 70 00 – Project Close-Out

C. Section 31 25 13 – Cleanup

PART 2 PRODUCTS (NOT USED)

2.01 HYDROSEED

A. hydroseed disturbed areas on the exterior slope of the embankment as indicated on the Project Plans and specified herein following installation of straw wattles.

B. The hydroseed mix shall have the following characteristics:
    1. Seed mix:
        a. Bromus mollis (Blando Brome) at an application rate of 40 lbs / acre
        b. Trifolium hirtum (Hykon Rose Clover) at an application rate of 20 lbs / acre

C. Fertilizer:
    1. 16-20-0 & 15% Sulphur at an application rate of 500 lbs / acre

D. Mulch:

E. Straw at an application rate of 4,000 lbs / acre

PART 3 EXECUTION

3.01 GENERAL

A. Straw bales, wattles, fiber rolls, gravel bags, or equivalent devices shall be installed around the perimeter of any ground which is disturbed beyond the outer grade break of the project to prevent debris from being transported to the Santa Rosa Creek via runoff.

B. The use of hazardous materials during construction shall be minimized to the extent practical, and the amount of hazardous materials stored on-site shall be limited to what is needed to immediately support construction activities.

C. Inactive material stockpiles must be covered and bermed at all times.

D. All ground disturbing activities will be prohibited from taking place during the rainy season (November-March).

E. In the case of a rain event, active debris boxes shall be covered during rain events to prevent contact with rainwater.

3.02 HYDROSEED APPLICATION

A. Hydroseeding shall be conducted in a three step process as follows:

1. Evenly apply seed mix and fertilizer to the exposed slope.
2. Evenly apply mulch over the seed and fertilizer.
3. Stabilize the mulch in place.

B. Applications shall be broadcasted mechanically or manually at the rates specified herein. Seed mix and fertilizer shall be worked into the soil by rolling or tamping. If straw is used as mulch, straw shall be derived from wheat, rice or barley and be approximately 6 to 8 inches in length. Stabilization of mulch shall be done hydraulically by applying an emulsion or mechanically by crimping or punching the mulch into the soil.

END OF SECTION

SECTION 31 35 19

GEOTEXTILE UNDERLAYMENT

PART 1 GENERAL

1.01 SUMMARY

A. Geotextile shall be installed at the locations indicated on the Project Plans, as directed by the Engineer, in conformance with the manufacture's written instructions, and as required herein.

B. Geotextile shall be installed under all riprap locations.

1.02 RELATED SECTIONS:

A. Section 31 23 00 – Excavation and Fill

B. Section 31 37 00 – Riprap

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM D 5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles
2. ASTM D 4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
3. ASTM D 6241, Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
4. ASTM D 4533, Standard Test Method for Index Trapezoidal Tearing Strength of Geotextiles
5. ASTM D 4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile
6. ASTM D 4491, Standard Test Method for Water Permeability of Geotextiles by Permittivity
7. ASTM D 4355, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
8. ASTM D 4354, Standard Practice for Sampling of Geosynthetics for Testing
9. ASTM D 4759, Standard Practice for Determining the Specifications Conformance of Geosynthetics

1.04 QUALIFICATIONS

A. Manufacturer

1. Manufacturer shall have manufactured a minimum of 10,000,000 square feet of geosynthetic material during the last year.

B. Installer

1. Installer shall have installed a minimum of 1,000,000 square feet of geosynthetic in the last 5 years.
2. The Installation Supervisor shall have worked in a similar capacity on projects similar in size and complexity.

1.05 MEASUREMENT

A. Measurement for the geotextile is in square yards, based upon the locations shown on the contract drawings.

B. Contractor is responsible for determining actual square yards required accounting for waste, overlaps, damaged materials and repairs.

1.06 MATERIAL LABELING, DELIVERY, STORAGE AND HANDLING

A. Each roll delivered to the site shall be wrapped and labeled by the manufacturer. The label shall identify the following:

1. Manufacturer’s name
2. Product identification
3. Length
4. Width
5. Roll number
6. Production date

B. Geosynthetics shall be delivered in rolls wrapped in a UV protective film and packaged to ship by appropriate means to prevent damage to the material and to facilitate off-loading.

C. The geosynthetics shall be protected from moisture, ultraviolet radiation, puncture, chemicals, temperatures in excess of 140ºF, or other damaging or deleterious conditions during shipment, storage, and prior to installation.

1.07 WARRANTY

A. Geosynthetics shall both warranted against defects in materials and workmanship for a period of 1-year following the date of installation.

PART 2 PRODUCTS

2.01 GEOTEXTILE PROPERTIES

A. The geotextile shall be a needle-punched nonwoven made of 100% polypropylene staple filaments that resists ultraviolet and biological deterioration, rotting, naturally encountered basics and acids.

B. Geotextile shall satisfy the requirements as outlined in AASHTO M-288-06 for Class 1 applications.

C. The geotextile shall have properties that meet or exceed the values listed in the following table:

Property	Test Method	Minimum Value
Grab Tensile Strength	ASTM D4632	200 lbs
Grab Tensile Elongation	ASTM D4632	50%
Trapezoid Tear Strength	ASTM D4533	85 lbs
Puncture Resistance	ASTM D6241	535 lbs
Apparent Opening Size	ASTM D4751	80 US Std. Sieve
Permittivity	ASTM D 4491	1.4 sec-1
Water Flow Rate	ASTM D4491	95 gpm / sq. ft.
UV Resistance	ASTM D4355 (after 500 hours)	70 % strength retained

PART 3 EXECUTION

3.01 PREPARATION

A. Finished grade surface to receive geotextile materials shall be shaped to an even surface and to required depth and section as indicated on Project Plans.

B. Remove sharp sticks, stones and trash from finished grade surface that may puncture the geotextile.

C. All subgrade damaged by construction equipment and deemed unsuitable for geotextile installation shall be repaired prior to placement of the geotextile.

3.02 PREPARATION

A. Placement of geocomposite underlayment shall not commence until the Engineer has accepted the subgrade preparation.

B. The subgrade shall be maintained in a firm, clean, dry and smooth condition during geocomposite and lining installation.

C. The Geomembrane Installer and Engineer or Engineers Representative shall provide daily written acceptance for the surface to be covered by the

geocomposite in that day's operations. The surface shall be maintained in a manner, during geomembrane installation, to ensure subgrade suitability.

3.03 MATERIAL PLACEMENT

A. Erosion control geotextile shall be placed directly on the finished grade surface indicated on the Project Plans.

B. Geotextile shall be rolled out and placed in a manner that prevents damage and minimizes folds and creases.

C. Geotextile shall be installed in the direction of the slope.

D. In the presence of wind, all geotextile shall be weighted down with sandbags or a similar weight and shall remain in place until installation of riprap has occurred to a sufficient degree.

E. The geotextile shall be anchored using 18 inch long anchor pins or similar to secure the geotextile in place during riprap installation.

F. In applying fill material, no equipment shall drive directly across the geotextile until it has been covered with a layer of riprap.

G. Riprap placement shall proceed immediately following the placement, installation, inspection and acceptance of the geotextile underlayment. Riprap placement shall begin at the toe and proceed up slope as indicated in Section 31 37 00.

H. Field monitoring shall be performed to verify that the riprap placement does not damage the geotextile or move the geotextile out of position. Riprap shall not be dropped more than 2 feet onto geotextile or as recommended by the geotextile manufacturer.

3.04 SEAMS AND OVERLAPS

A. Geotextile shall be overlapped a minimum of 2 feet side-to-side.

B. Only full length rolls shall be used on the slope. End to end overlapping of rolls will not be allowed.

C. Curves may be accomplished by folding or cutting the fabric to conform to the curve.

3.05 REPAIR

A. Prior to covering the deployed geotextile, each roll shall be inspected for damage.

B. Any rips, tears or damaged areas on the deployed geotextile shall be overlapped a minimum of 3 feet beyond the edges of the damage.

END OF SECTION

SECTION 31 37 00

RIPRAP

PART 1 GENERAL

1.01 SUMMARY

A. The work covered by this Section includes furnishing all labor, materials, equipment, tools, and incidentals necessary to place riprap slope protection as shown on the Project Plans.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals

B. Section 31 23 00 – Excavation and Fill

1.03 SUMITTALS

A. Submit materials test data and gradation information for riprap material(s) from each source.

B. Submit riprap placement method(s).

PART 2 MATERIALS

2.01 RIPRAP SLOPE PROTECTION

A. Interior slope protection shall consist of basalt field stone or rough un-hewn quarry stone of approximate rectangular shape. At least one face of each rock shall be fractured.

B. Rounded, natural river-run rock will not be permitted.

C. The percentage composition by weight of the crushed rock use for slope protection shall conform to the following gradation:

Rock Size	Percentage Larger Than
50 lbs	0%
25 lbs	10% - 40%
10 lbs	40% - 75%
5 lbs	75% - 90%
1 lbs	100%

For all rock sizes within a class, the percentage shall be determined on the basis of the ratio of the number of individual rocks larger than the smallest size shown for that class compared to the total number of rocks.

D. The density of individual rocks shall be equal to or greater than 155 lbs/ft3.

E. Riprap shall conform to the following quality requirements:

Test	California Test	Requirement
Apparent Specific Gravity	206	2.5 min.
Absorption	206	4.2% max.*
Durability Index	229	52 min.*

* Based on the formula listed below, absorption may exceed 4.2 percent if DAR is greater than 10. Durability Index may be less than 52 if DAR is greater than 24.

$$\frac{\text{Coarse Durability Index}}{\text{\% Absorption + 1}} = \text{Durability Absorption Ratio (DAR)}$$

F. Flat or needle shapes will not be accepted unless the thickness of the individual pieces is greater than 0.33 times the length.

PART 3 EXECUTION

3.01 GENERAL

A. Riprap rock slope protection shall be placed at locations shown on the Project Plans.

B. Rocks shall be placed as to provide a minimum number of voids, and the larger rocks shall be placed on the outside surface of the slope protection. The rocks may be placed by dumping and spreading.

C. Tracked equipment which may damage the rock shall not be used for spreading the rock.

D. Local surface irregularities of the slop protection shall not vary from the planned slopes by more than one foot measured at right angles to the slope.

END OF SECTION

SECTION 31 41 00

SHORING AND BRACING

PART 1 GENERAL

1.01 SUMMARY

A. The work covered by this Section includes providing adequate sheeting, shoring and bracing of trenches and other excavations, and/or equipment method, for the protection of life or limb as required by the State of California Construction Safety Orders, the Safety Regulations of the Federal Occupational Safety and Health Administration and by these Special Provisions.

B. All safety orders, rules and regulations of Cal/OSHA and/or the Federal OSHA applicable to the work to be done under this Contract shall be obeyed and enforced by the Contractor.

1.02 RELATED SECTION

A. Contract General Specifications

B. Section 01 33 00 – Submittals

C. Section 31 23 00 – Excavation and Fill

D. Section 31 23 19 – Dewatering

E. Section 31 23 25 – Controlled Density Fill

F. Reference Document: Geotechnical Report (by others) is available, as noted in Section 31 23 00.

1.03 SUBMITTALS

A. At least 15 working days before beginning excavation on a trench 5 feet or more in depth, the Contractor shall submit to the Engineer and DSOD a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for work protection from caving ground hazard.

   1. Excavation on a trench 5 feet or more in depth shall not take place until the submitted shoring and bracing plan has been reviewed by the Engineer and DSOD.

B. The plan shall be prepared and signed by a registered Professional Civil or Structural Engineer.

C. The excavation and shoring analysis and design shall be fully coordinated with the dewatering plan.

D. The shoring shall be designed for anticipated earth, water, and surcharge pressures and loading.

1.04 GENERAL

A. The Contractor shall obtain a permit from Cal/OSHA before starting work.

B. The Contractor shall ensure that employees entering excavations are protected from cave-ins, failure of protective systems, hazardous atmospheres, vehicular traffic, falling loads, and any other hazardous conditions.

C. The Contractor shall have a competent person on-site who will make daily inspections of excavations, adjacent areas, and protective systems. The competent person will be responsible for ensuring that the protective system is based upon soil classifications, and that it provides the required protection in accordance with CCT, Title 8, and Section 1541.1.

D. Sloping or benching of excavations will not be allowed unless otherwise indicated on the Project Plans.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Shoring shall be removed in such a manner as to prevent caving at the walls of the excavation or damage to piping or other structures.

B. All shored excavations shall be backfilled with controlled density fill before the shoring is removed.

3.02 PROCEDURAL PRACTICES

A. Excavations shall be so braced and supported that they will be safe, and the ground alongside the excavation will not slide or settle, and all existing improvements of any kind, either on public or private property will be fully protected from damage. If any damage does result to such improvements, the Contractor shall make the necessary repairs or reconstruction at his own expense and as directed by the Engineer.

B. All excavations and shored pits shall have barricading, fall protection handrails, and access ladders in accordance with Cal/OSHA requirements.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes grading, compaction, materials quality requirements, and placement of aggregate base within specified tolerances, slopes, lines, transitions, and existing grades as indicated on the Project Plans.

1.02 RELATED SECTIONS

A. Section 31 20 00 – Earthwork

B. Section 31 23 33 – Trenching and Backfilling

1.03 REFERENCES

A. California Department of Transportation (Caltrans) Standard Specifications
   1. Section 26 – Aggregate Bases

B. ASTM International (ASTM)
   1. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)

1.04 SUMITTALS

A. Submit materials test data and gradation information for aggregate base and shale surfacing materials.

PART 2 PRODUCTS

2.01 AGGREGATE BASE

A. Aggregate base shall conform to and meet the quality requirements of Section 26 of the Caltrans Standard Specifications for 1½" maximum Class 2 Aggregate Base, except that reclaimed asphalt materials will not be allowed.

PART 3 EXECUTION

3.01 COMPACTION

A. Place and compact aggregate based to not less than 95% relative compaction per ASTM D1557 unless indicated otherwise herein or on the Project Plans.

END OF SECTION

SECTION 32 15 40

CRUSHED STONE (SHALE) SURFACING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Grading, compaction, materials quality requirements, placement of aggregate base and shale surfacing within specified tolerances and slopes in the site(s) to lines, transitions, and existing grades indicated on the Project Plans.

B. Perform necessary grading to achieve final elevations closely approximating those shown on the Project Plans

1.02 RELATED SECTIONS

A. Section 31 25 13 – Erosion Controls

1.03 REFERENCES

A. California Department of Transportation Standard Test Method:

1. California Test Method No. 202 – Method of Test for Sieve Analysis of Fine and Coarse Aggregates
2. California Test Method No. 217 – Method of Test for Sand Equivalent

B. American Society for Testing and Materials:

1. ASTM D 1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
2. ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber-Balloon Method
3. ASTM 6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.04 SUMITTALS

A. Submit materials test data and gradation information for aggregate base and shale surfacing materials.

PART 2 PRODUCTS

2.01 CRUSHED SHALE

A. The percentage composition by weight of the shale shall conform to the following gradation as determined by California Test Method No. 202:

Sieve Size	Percent Passing
1½ inch	90-100
No. 4	25-40
No. 200	2-9

B. The minimum sand equivalent value shall be 20 as determined by California Test Method No. 217.

1. No single aggregate grading or Sand Equivalent test shall represent more than 500 cubic yards or one day's production, whichever is smaller.

C. Shale shall meet the following quality requirements:

1. Shale shall be free from organic matter and other deleterious substances
2. Shale shall be of such nature that it can be compacted readily under watering and rolling to form a firm stable surface.
3. Shale aggregate may include material processed from reclaimed portland cement concrete, lean concrete base, cement treated base or a combination of any of these materials. The amount of reclaimed material shall not exceed 50 percent of the total volume of the aggregate used.
4. The shale aggregate shall have a minimum durability index of 35 and a minimum resistance (R-value) of at least 78.
   a. The shale shall not be treated with lime, cement or other chemical material before the Durability Index test is performed.

D. Submit test data to confirm compliance with the above requirements.

PART 3 EXECUTION

3.01 GENERAL

A. Place and compact shale surfacing to a relative compaction of not less than ninety percent (90%) per ASTM 1557 Test Procedure to a compacted depth of not less than
6-inches, unless shown otherwise on Project Plans.

3.02 TRANSITIONS AND CONFORMANCE

A. The Contractor shall grade and blend the transitions between new and old shale surfacing as required to promote a smooth transition that prevents the puddling of water.

END OF SECTION

SECTION 33 05 15

PRECAST CONCRETE UTILITY STRUCTURES AND COVERS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following precast concrete items:

1. Precast Concrete Meter Vault
2. Spring Assisted Cover

B. This section also includes specifications on joint sealants and waterproofing for the precast concrete items specified herein.

1.02 RELATED SECTIONS

A. Section 03 30 01 – Concrete and Reinforcement

1.03 SUBMITTALS

A. Contractor shall provide a submittal for all precast concrete utility structures and vaults along with the associated cover and appurtenances as a single complete submittal for each application.

PART 2 PRODUCTS

2.01 GENERAL

A. Precast structures and covers shall be designed to withstand AASHTO H-20 Traffic Loading.

2.02 PRECAST METER VAULT

A. Precast concrete meter vault shall have clear inside plan dimensions as designated on the Project Plans and shall be of sufficient depth to provide a minimum of 6 inches clearance between bottom of pipe flanges and appurtenances and the finished vault floor.

B. Vault walls shall be reinforced sufficient to withstand loads imposed by complete burial in saturated soil.

2.03 SPRING ASSITED COVERS

A. Vaults shall be furnished with a two-leaf hinged, hydraulic-assisted aluminum cover.

B. Each leaf of the cover shall permit full opening of the vault. Cover shall be furnished with suitable hardware to secure the leaves in the closed position.

2.04 CONCRETE WATERPROOFING

A. The Contractor shall waterproof the inside and outside of new precast concrete structures and vaults with a manufacturer approved waterproofing compound.

B. Waterproofing compound shall be one of the following or an approved equal:
   1. Xypex as manufactured by Xypex Chemicals Ltd.
   2. Thoroseal as manufactured by Standard Drywall Products Inc.

2.05 JOINT SEALING

A. Joint sealants shall meet or exceed all requirements of ASTM 990 for joints, concrete pipe, manholes and precast box sections, using Preformed Flexible Joint Sealants.

B. Sealants shall meet the requirements of the Federal Specifications SS-S210-A, “Sealing Compound Preformed Plastic for Pipe Joints”.

C. The sealing compound shall not leak at joints, while being tested at 10 psi, for a period of 24 hours.

D. The Sealing compound shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler, and shall contain no solvents, irritating fumes or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength.

E. Manufacturers: The following or equal:
   1. RAM-NEK as manufactured by Henry Company.

PART 3 EXECUTION

3.01 GENERAL

A. It is the Contactor’s responsibility to ensure that precast structures are laid and bedded on sound materials, existing and new. Any field conditions that may affect grade shall be brought to the attention of the Engineer prior to installation.

B. Waterproofing compound shall be applied with two coats as recommended by the manufacturer to achieve a completely watertight wall. The Contractor shall be responsible to provide a completely watertight structure, with no visible signs of leakage.

C. Joints between vault sections, space around pipe penetrations and lifting holes shall be filled with grout and finished flush with the walls of the structure.

D. Provide an 8” wide by 12” thick concrete collar around vault cover if the cover is not cast into the box. Edges shall be protected from site construction.

3.02 JOINT SEALING

A. Joint sealants shall be applied as specified in writing according to the manufacturer.

B. Joint sealing shall be allowed to compress and set for a minimum of seven (7) days following installation before backfill material is placed.

END OF SECTION

SECTION 33 10 05

BASIC PIPING MATERIALS AND METHODS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Basic piping materials and methods.

1.02 RELATED SECTIONS

A. Section 01 75 05 – Start-Up and Testing

B. Section 03 30 01 – Concrete and Reinforcement

C. Section 05 50 00 – Metal Fabrications

D. Section 31 23 33 – Trenching and Backfilling

E. Section 33 10 10 – Pipe and Appurtenances

1.03 DEFINITIONS

A. Aboveground Piping: Piping within buildings, tunnels, or other structures without regard to elevation of piping, or exposed piping outside buildings and structures.

B. Underground Piping: Piping buried in soil or cast in concrete.

1.04 SYSTEM DESCRIPTION

A. Except in details, piping is indicated diagrammatically. Not every offset and fitting, or structural difficulty that may be encountered has been indicated on the Project Plans. Sizes and locations are indicated on the Project Plans.

B. Perform minor modifications to piping alignment where necessary to avoid structural, mechanical, or other type of obstructions that cannot be removed or changed.

1. Modifications are intended to be of minor scope, not involving a change to the design concept or a change to the Contract Price or Contract Times.

1.05 PERFORMANCE REQUIREMENTS

A. Protection for piping under Pressure:

1. Lay piping under pressure flat or at a continuous slope without air traps, unless otherwise indicated on the Project Plans.

B. Restraining Piping:

1. All piping shall be restrained as indicated on the Project Plans.
2. Use mechanical or structural restraints as indicated on the Project Plans and in accordance with the following:
   a. When piping is underground, use mechanical restraints.
   b. When piping is above ground, use mechanical or structural restraints.
   c. If thrust forces are not provided, determine thrust forces by multiplying the nominal cross sectional area of the piping by the design test pressure of the piping.
3. Provide restraints with ample size to withstand thrust forces resulting from test pressures.

C. Connections to Existing Piping:

1. Expose existing piping to which connections are to be made with sufficient time to permit, where necessary, field adjustments in line, grade, or fittings.
2. Make connections to existing piping and valves after sections of new piping to be connected have been tested and found satisfactory.
3. Provide spools, sleeves, flanges, nipples, couplings, adapters, and other fittings needed to install or attach new fittings to existing piping and to make connections to existing piping.

D. Connections to In-Service Piping:

1. Where operation and maintenance of existing facilities require that a shutdown be made during hours other than normal working hours, perform the related work in coordination with the hours of actual shutdown.

E. Connections at Dissimilar Metals:

1. Connect ferrous and nonferrous metal piping, tubing, and fittings with dielectric couplings specifically designed for the prevention of chemical reactions between dissimilar metals.
2. Nonferrous metals include aluminum, copper, and copper alloys.

F. Piping Alternatives:

1. Provide piping in accordance with this Section, unless indicated on the Project Plans or specified otherwise.
2. Alternative Pipe Ratings: Piping with greater pressure rating than specified may be substituted in lieu of specified piping without changes to the Contract Price. Piping of different material may not be substituted in lieu of specified piping materials.
3. Alternative Joint Types: Piping and fittings with different joint types other than those indicated on the drawings will not be allowed.

4. Valves in Piping Sections: Capable of withstanding specified test pressures for piping sections and fabricated with ends to fit piping.
5. For flanged joints, where one of the joining flanges is raised face type, provide a matching raised face type flange for the other joining flange.

1.06 SUBMITTALS

A. Layout Drawings: Detailed layout drawings showing dimensions and alignment of pipes; location of valves, fittings, and appurtenances; location of field joints; location of pipe hangars and supports; connections to equipment or structures; location and details of shop welds; and thickness and dimensions of fittings and gaskets.

1. Submit final drawings after layout drawings have been reviewed and accepted by the Engineer.

B. Product Data:

1. Photographs, drawings, and descriptions of pipe, fittings, welding procedures, coatings, pickling and passivating procedures.
2. Material specifications for pipe, gaskets, fittings, and couplings.
3. Data on joint types and components used in the system including stub ends, backing flanges, flanged joints, etc.

C. Manufacturing certifications.

D. Welder qualification certificates and welding procedures.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 VERIFICATION OF EXISTING CONDITIONS

A. Locate and expose existing structures, piping, conduits, and other facilities and obstructions which may affect construction of piping or piping structures before starting excavation for new piping and appurtenances.

B. Verify sizes, elevations, locations, and other relevant features of existing facilities and obstructions. Determine conflicts for the construction of the new underground piping and appurtenances.

C. Make piping location and grade adjustments to resolve conflicts between new piping and existing facilities and obstructions.

3.02 CONCRETE CRADLE

A. Buried pipe shall be encased in a concrete cradle where indicated on the Project Plans.

B. Concrete encasement shall be according to the details shown on the Project Plans and requirements set forth in Section 03 30 01 – Concrete and Reinforcement.

3.03 THRUST RINGS

A. Thrust rings continuously welded to the adjacent piping shall be supplied and cast into concrete walls or slabs where indicated on the Project Plans.

B. Thrust rings and the adjacent piping which thrust rings are attached to shall be rated to transfer the proposed thrust loading indicated.

C. Piping which thrust rings are attached to shall be rated for the required water working pressures indicated herein. Thrust rings supplied with tapped holes shall match the bolting pattern of adjacent flanged piping or valves where indicated on the Project Plans and specified herein. Tapped thrust ring flanges shall be rated for the required water working pressures indicated herein.

3.04 WALL SLEEVES

A. Cast sleeves in walls for penetrations of buried rigid piping through structures.

B. Link Seal: Use 2 link seals where seal is used to seal at walls thicker than 12 inches. Mount one seal on the inside face of the wall and the other on the outside face of the wall. Coordinate the inside diameter of the wall sleeve with the size of the seal to provide watertight sealing.

3.05 BURIED PIPE AND PIPE LAYING

A. Bury piping with minimum 3-foot cover without air traps (artificial high points), unless otherwise indicated on the Project Plans.

B. Place piping with top or bottom markings with markings in proper position.

C. Lay piping on an unyielding foundation with uniform bearing under the full length of barrels unless otherwise indicated on the Project Plans.

D. Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and efficient prosecution of the work. All pipe, fittings, valves and hydrants shall be carefully lowered into the trench by means of a derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to piping materials and protective

coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

E. The pipe and fittings shall be inspected for defects and be rung (for cast iron) with a light hammer to detect cracks.

F. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that before lowering the pipe into the trench, a heavy tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe.

G. At the end of each day's construction and at times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer.

H. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or cement lining and so as to leave a smooth end at right angles to the axis of the pipe.

I. Pipe shall be laid with bell ends facing in the direction of laying, unless otherwise directed by the Engineer.

J. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions, or where long radius curves are permitted, the amount of deflection shall not exceed 50% of that recommended by the pipe manufacturer.

K. No pipe shall be laid in water or when, in the opinion of the Engineer, trench conditions are unsuitable.

L. Metal harness, tie rods, bolts, rods and clamps of adequate strength to prevent the movement of fittings, specials and adapters shall be used where indicated on the Project Plans.

M. The bottom of the trench shall be smooth and free from pieces of rock or other material that would tend to injure the pipe. In case rocks or stones are encountered, they should be removed to a depth of 6-inches below grade and holes filled with suitable material carefully tamped to grade.

N. The pipe shall be handled in accordance with the manufacturer's recommendations.

3.06 GRADE AND ALIGNMENT CONTROL

A. The Contractor shall utilize the necessary trenching and installation procedure to ensure the pipe is installed straight or on smooth curves, horizontal or vertical and to the lines and grades shown on the Project Plans. Misalignment caused by the trencher or backhoe shall be corrected before pipe is installed to provide specified room for bedding, concrete encasement, and/or compacting around the pipe.

3.07 EXPOSED PIPE INSTALLATION

A. Install exposed piping plumb, level, and in straight runs parallel to the axes of structures, unless indicated otherwise on the Project Plans.

   1. Match and properly orient flanges, unions, flexible couplings, and other connections.

B. Exposed pipe installation shall conform to the approved shop drawings. The Contractor shall prepare and submit shop drawings for all exposed piping systems. Shop drawings shall be to scale locating all fittings, valves, supports, hangers and other appurtenances to be installed.

C. In addition to the joints indicated on the Project Plans, provide unions, flexible couplings, flanged joints, and other types of joints or means which are compatible with and suitable for the piping system, and necessary to allow ready assembly and disassembly of the piping.

D. Pipe shall be installed without springing or excessive force to avoid stress in pipe, valves, appurtenances and connected equipment. Flanges shall be set plumb, level, in alignment and perpendicular to the axis of the pipe. Except where flange adapters are required to facilitate component removal, pipe spools shall be fabricated with flanges on both ends to precise dimensions according to the shop drawings.

E. Where valve handwheels are furnished, they shall be oriented to provide convenient access and to avoid interference with other components.

F. Pipe taps to the pipe barrel will not be permitted. Where pipe taps are required in ductile iron pipe, they shall be made using service saddles or at tapping bosses of fittings, valve bodies or equipment castings. Pipe taps in steel pipe shall be made with Thread-O-Let type welding fittings.

G. Pipe supports and hangers shall be installed as shown on the Project Plans and at all locations necessary to provide adequate support for piping, valves and imposed forces.

H. Assemble piping without distortion or stresses caused by misalignment.

1. Do not subject piping to bending or other undue stresses when fitting piping. Do not correct defective orientation or alignment by distorting flanged joints or subjecting flange bolts to bending or other undue stresses.
2. Flange bolts, union halves, flexible connectors, and other connection elements shall slip freely into place.

3.08 PIPE TESTING

A. After the pipe has been laid and all backfill placed and compacted to the requirements specified in these Technical Specifications, but prior to placing any permanent surfacing, the Contractor shall subject the newly laid pipe, valves, fittings, and appurtenances to a hydro-static test and a leakage test.

B. The pipe shall be filled with water for a minimum of 24 hours before the pipe is tested.

C. Leakage testing shall occur prior to installation of the concrete pipe cradle and prior to backfilling. All new piping, valves, fittings, and appurtenances, including the tie-in to the existing main shall be leakage tested using the pressures from the existing geysers pipeline.

D. Hydrostatic testing shall not occur until at least 28-days after installation of concrete structures and thrust blocks required to resist the forces imposed by the test pressure and/or until the concrete has obtained the specified strength.

E. The pipeline between the new butterfly valve and the fixed-cone valve shall also be hydrostatically tested to a pressure of not less than 350 psi for 15 minutes.

F. The Contractor shall provide all water necessary for testing and shall be responsible to provide, install, and operate all valves, gauges, measuring devices, pumps, pipe connections, and apparatus necessary to conduct the tests. The Contractor shall provide all necessary temporary blow-offs, plugs, and caps of sufficient size and strength necessary to perform the pipe testing described herein.

G. Appurtenances necessary to perform the hydrostatic and leakage testing are not specifically shown on the Project Plans, but shall be provided as necessary for hydrostatic testing of the pipelines whether or not the information is specifically enumerated in the City Standards or these Special Provisions and shall be included in prices paid for the various contract items of work, and no additional compensation will be allowed therefor.

H. Care shall be taken in filling and testing the new pipe to prevent damage due to water hammer caused by entrapped air. All air shall be expelled from the pipe line prior to testing. In no case shall the filling rate exceed 50 gallons per minute.

I. The Contractor, at his option, may test the line at any time during construction. However, the final test for acceptance shall be made only after all backfill is in place.

J. The Contractor shall make the taps into the pipe and shall furnish all necessary assistance for conducting the tests. Before applying the test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at the points of the highest elevation, and afterward tightly plugged.

K. No pipe installation will be accepted until all leakage is stopped. The Contractor shall, at his own expense, locate the cause and repair any leakage.

L. Upon completion of the tests, the test water shall be carefully disposed of by the Contractor in a manner satisfactory to the City. The Contractor shall assume full responsibility for any property or personal damage incurred during the test operation or from disposal of test water.

3.09 CLEANING

A. Upon completion of installation, clean piping interior of foreign matter and debris. Perform special cleaning when required by these Specifications.

END OF SECTION

SECTION 33 10 10

PIPE AND APPURTENANCES

PART 1 GENERAL

1.01 SUMMARY

A. Pipe of the following types:

1. Ductile Iron Pipe and Fittings
2. Carbon Steel Pipe and Fittings – Fusion Bonded Epoxy Lined and Coated
3. Stainless Steel Pipe and Fittings

B. Appurtenances

1. Mechanical Joint Restraints
2. Dismantling Joints
3. Flange Coupling Adapters
4. Underground Warning Tapes
5. Tracer Wire
6. Link Type Seals

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 33 10 05 – Basis Piping Materials and Methods

B. Section 31 23 33 – Trenching and Backfilling

1.03 REFERENCES

A. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):

1. B16.1 - Cast Iron Pipe Flanges and Flanged Fittings
2. B16.3 - Malleable Iron Threaded Fittings.
3. B16.5 - Pipe Flanges and Flanged Fittings.
4. B16.9 - Factory Made Wrought Steel Butt Welding Fittings.
5. B31.3 - Chemical Plant and Petroleum Refining Piping.
6. B36.19 - Stainless Steel Pipe

B. American Society of Mechanical Engineers (ASME):

1. Boiler and Pressure Vessel, Section IX.

C. American Society for Testing and Materials (ASTM):

1. A182 - Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
2. A193 - Specification for Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service.
3. A194 - Specification for Carbon and Alloy Steel Nuts and Bolts for High Temperature and High Pressure Service.
4. A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
5. A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
6. A276 - Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
7. A312 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes.
8. A 536 - Ductile Iron Castings.
9. A 674 - Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids
10. A774 - Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Services at Low and Moderate Temperatures.
11. A778 - Standard Specification for Welded, Unannealed, Austenitic Stainless Steel Tubular Products.

D. American Water Works Association (AWWA):

1. C104 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
2. C105 - Polyethylene Encasement for Ductile Iron Pipe Systems.
3. C110 - Ductile Iron and Gray Iron Fittings, 3 Inches through 48 Inches, for Water and Other Liquids.
4. C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. C115 - Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
6. C151 - Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
7. C153 - Ductile Iron Compact Fittings, 3 Inches Through 24 Inches, and 54 Inches Through 64 Inches, for Water Service.
8. C213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.

9. C219 - Bolted, Sleeve-Type Couplings for Plain-End Pipe
10. C600 - Installation of Ductile Iron Water Mains and Their Appurtenances.
11. C606- Grooved and Shouldered Joints.
12. M11 - Steel Pipe: A Guide for Design and Installation, Fifth Edition

1.04 DESIGN REQUIREMENTS

A. All piping, fittings, and joints shall be restrained and rated for a minimum water working pressure of 350 psi.

B. Special flange gaskets containing a modular annular sealing element shall be used where necessary to provide required pressure rating of flanged piping.

C. All pipe assemblies shall be shop fabricated and finished in accordance with shop drawings developed to reflect the actual conditions of the Project site, as shown on the Project Plans, and specified herein. Shop drawings shall be submitted to the Engineer for review.

D. Pipe sizes specified in the Specifications and indicated on the Project Plans are nominal unless noted otherwise.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pipe shall conform to the American National Standard Institute (ANSI) A21.51 (AWWA C151).

B. Ductile iron pipe shall be a minimum Thickness Class 52 rated for the required water working pressure indicated herein.

C. Ductile iron pipe and fittings shall be coated outside with a bituminous coating and shall be lined inside cement mortar in conformance with the applicable sections of the ANSI A21.4 (AWWA C104).

D. All buried ductile iron pipe, fittings, valves and appurtenances shall be encased in an 8 mil polyethylene tube in accordance with ANSI/AWWA C105/A21.5. Installation of polyethylene tube shall be by Method A: One length of polyethylene tube for each length of pipe, overlapped at joint.

E. Mechanical joint fittings shall conform to ANSI A21.53 (AWWA C153) and shall be rated for the required water working pressure indicated herein. End connections shall be as shown on the Drawings.

F. Ductile iron flanged fittings and flanges shall be Class 250 and shall conform to ANSI A21.10 (AWWA C110), bituminous coated outside with the proper type of ends to match adjacent connections. Flanges shall be faced and finished smooth.

G. All bolts for flanges, mechanical joints, flange adapters, and hardware used on ductile iron pipe and fittings shall be stainless steel, Type 316. Bolt threads shall be lubricated with an anti-seize thread compound such as Never-Seez Stainless Anti-Seize.

2.02 CARBON STEEL PIPE AND FITTINGS

A. Carbon steel pipe shall be ASTM A53 or API 5L, standard weight, seamless or ERW and shall be rated for the required water working pressure indicated herein.

B. All pipe assemblies shall be shop fabricated and fusion-bonded epoxy coated inside and outside prior to delivery to the Project site. There shall be no field cutting, welding, bending, or machining of carbon steel pipe, fittings and assemblies after the application of the epoxy coating.

1. Fusion bonded epoxy coating shall be a 100% solids, fusion-bonded, thermo-setting resin powder such as Skotchkote 203 Fusion Bonded Epoxy Coating as manufactured by the Electro-Products Division of the 3M Company or approved equal.
2. Fusion bonded epoxy coating shall be applied in accordance with the manufacturer's recommendations and in accordance with AWWA Standard C213 to a minimum 12 mils dry film thickness and a maximum of 16 mils dry film thickness.
3. The coating shall be inspected and tested for thickness and pin holes. Damaged areas shall be coated and patched according to the manufacturer's instructions with 3M Scotchkote 306.
4. Any coating imperfections shall be repaired at Contractor's expense.

C. Welding fittings shall be standard weight conforming to ASTM A234 and ASME
B16.9. Flanges shall be forged steel conforming to ASTM A105 and ASME B16.5. Flanges shall be Class 300, slip on or weld neck rated for the required water working pressure indicated herein.

D. Steel pipe and fittings for buried service shall be additionally protected against corrosion by wrapping in 8-mil, linear low-density polyethylene film (or 4-mil, high-density, cross laminated polyethylene film) per AWWA C105. The film shall be thoroughly taped closed around the pipe.

E. Pipe bedding for steel pipe and fittings used below grade shall be clean sand bedding (100% passing #4 sieve, <10% passing #200 sieve) and shall be used in lieu of the bedding materials specified in City Standard Drawing 215.

F. All bolts for flanges, flange adapters, and hardware used on carbon steel pipe and fittings shall be stainless steel, Type 316. Bolt threads shall be lubricated

with an anti-seize thread compound such as Never-Seez Stainless Anti-Seize.

2.03 STAINLESS STEEL PIPE AND FITTINGS

A. Stainless steel pipe and fittings shall have a minimum wall thickness corresponding to Schedule 40S in accordance with ASME/ANSI B36.10 and B36.19 and rated for the required water working pressures and to resist the required forces indicated herein.

B. Stainless steel pipe and fittings shall be manufactured of grade 316/316L conforming to ASTM A240.

C. Pipe and fittings shall be manufactured in accordance with A312, A774 and/or A778.

D. Stainless steel flanges shall be forged Type 316L conforming to ASTM A182 and ASME/ANSI B16.5. Flanges shall be Class 300, slip on or weld neck rated for the required water working pressure indicated herein. Forging material shall match the piping materials.

E. Stainless steel thrust rings and tie rod anchor points shall be manufactured of barstock conforming to ASTM A276 Type 316L. Barstock materials shall match the piping materials.

F. Tapped thrust rings shall be tapped according to ASME/ANSI B16.5 with a bolting pattern compatible with the fixed cone dispersion valve flange per Section 33 12 16.22 and rated to withstand the required water working pressures and to resist the required forces indicated on the Project Plans.

G. Tie rod anchor points shall be designed in accordance with AWWA M11 in the quantity and locations indicated on the Project Plans and rated to resist the forces imposed by the water working pressure indicated herein.

H. Fabrication of stainless steel pipe and fittings shall be welded together using full penetration welds, free of oxidation, crevices, pits and cracks and without undercuts. Provide weld crowns of 1/16 inch with tolerance of plus 1/16 inch and minus 1/32 inch.

   1. Where internal weld seams are not accessible, use gas tungsten-arc procedures with internal gas purge.

   2. Where internal weld seams are accessible, weld seams inside and outside using manual shielded metal-arc procedures.

I. Pickling and Passivation:

   1. Following shop fabrication of pipe sections, straight spools, fittings and other piping components, pickle and passivate fabricated pieces.

2. Immerse fabricated pieces in sulfuric acid solution followed by immersion in a nitric-hydrofluoric bath and subsequent wash at the proper temperature and length of time.
3. Finish Requirements: Remove free iron, heat tint oxides, weld scale, and other impurities, and obtain a passive finished surface.

J. Quality Control:
1. Provide written certification that the stainless steel pipe supplied conforms to the requirements of ASTM A778. Supplemental testing is not required.
2. Provide written certification that the stainless steel fittings supplied conform to the requirements of ASTM A774. Supplementary testing is not required.

K. All bolts for flanges, flange adapters, tie-rods, and hardware used on stainless steel pipe and fittings shall be stainless steel, Type 316. Bolt threads shall be lubricated with an anti-seize thread compound such as Never-Seez Stainless Anti-Seize.

2.04 MECHANICAL JOINT RESTRAINTS

A. The mechanical joint restraint system shall have a minimum safety factor of 2 to 1 against the forces imposed by the required water working pressure indicated herein.

B. Mechanical joint restraint system shall incorporate individually-actuating gripping surfaces to grip the pipe. The restraining twist off nut bolt system shall have a torque-limiting feature designed to break off at preset torque levels, thus insuring proper action of restraining device.

C. Applicable dimensions of mechanical joint restraints shall conform to ANSI/AWWA C111/A21.11 to facilitate use with mechanical joint bells on the ductile iron pipe, fittings, valves, and appurtenances specified herein.

D. Mechanical joint restraint glands and wedges shall be manufactured of ductile iron conforming to ASTM A536.

E. Restraint components shall be coated with a protective enamel, powder, or fusion bonded epoxy coating.

F. The restraint system shall be the Series 1100TDM Tandem MEGALUG Mechanical Joint Restraint manufactured by EBAA Iron, Inc., Tandem Stargrip Series 3000T manufactured by Star Pipe Products, or approved equal.

2.05 DISMANTLING JOINTS

A. Dismantling joint shall be capable providing a minimum 3-inch adjustment in length.

B. Dismantling joint shall be rated to withstand the required water working pressure indicated herein and shall be fully restrained to resist the forces imposed by the required water working pressure when assembled.

C. Dismantling joint end ring and body shall be manufactured of ASTM A36 carbon steel and supplied with a fusion bonded epoxy lining and coating conform to the requirements indicated in Part 2.02 above.

D. Dismantling joint shall be supplied with Class 300 flanges per ASME B16.5 with a bolting pattern compatible with the adjacent ductile iron flanges.

E. Dismantling joint tie-rods shall be stainless steel per ASTM A193 Grade B8 or B8M.

F. Dismantling joint shall be Series DJ400 manufactured by Romac Industries, Inc., Model 975 manufactured by Smith-Blair, Inc., or approved equivalent.

2.06 FLANGE COUPLING ADAPTERS

A. Flange coupling adapters shall be designed per AWWA C219 and rated to withstand the required water working pressure indicated herein and restrained using harness lugs and stainless steel tie rods to resist the forces imposed by the required water working pressure.

B. Flange coupling adapter end ring and body shall be manufactured of ASTM A36 carbon steel and supplied with a fusion bonded epoxy lining and coating conform to the requirements indicated in Part 2.02 above.

C. Flange shall be supplied with a bolting pattern compatible with the adjacent stainless steel square bottomed knife gate flanges per Section 33 12 16.21.

D. Tie-rods shall be stainless steel per ASTM A193 Grade B8M.

E. Flange coupling adapter shall be Series FJ400 manufactured by Romac Industries, Inc. or approved equivalent.

2.07 UNDERGROUND WARNING TAPES

A. Metallic detection tape; minimum 4 mil thick by 6 inch wide polyethylene film with wording, caution, and name of service followed by words, line buried below, repeated continuously along tape length, and alternate metallic and color strips, blue for water, orange for telephone, red for electric, green for sewer, yellow for gas, purple for recycled water, and other services.

2.08 TRACER WIRE

A. A #10 gauge insulated solid copper tracer wire shall be installed on the top of all underground non-ferrous piping and looped into all valve boxes.

1. Buried splices in the tracer wire shall be avoided by terminating the ends of the tracer wire in a concrete utility structure (i.e. valve box, meter box, etc.).
    a. Where an underground splice in the tracer wire is unavoidable, the ends of the wire shall be stripped bare and fastened together with an appropriately sized brass split bolt. The connection shall then be completely encased with 100% silicone sealant and tightly wrapped with tape.
2. The tracer wire shall be attached to the pipe with duct tape or other means to prevent displacement during backfilling operations.
3. The tracer wire on services shall be connected to the tracer wire on the main should there be one. The connection shall be made by using an appropriately sized brass split bolt and wrapping the connection to create a waterproof splice.
4. Where new pipe joins to an existing pipe without tracer wire wrap the tracer wire around the existing pipe as far back as possible.

2.09 LINK TYPE SEALS

A. Manufacturers: One of the following or equal:
    1. Calpico, Inc.
    2. Thunderline Corporation, Link-Seal.

B. Characteristics:
    1. Modular mechanical type, consisting of interlocking neoprene or synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening.
    2. Assemble links solely with stainless steel bolts and nuts to form a continuous rubber belt around the pipe.
    3. Provide a stainless steel or glass reinforced nylon pressure plate under each bolt head and nut. Isolate pressure plate from contact with wall sleeve.

2.10 DISSIMILAR PIPE TRANSITIONS

A. A full-face flange gasket and ASTM A193 Grade B8M Type 316 stainless steel studs and nuts with a Xylan or PTFE coating shall be provided between transitions of dissimilar piping materials. Transitions of dissimilar piping materials included ductile iron and stainless steel and ductile iron and epoxy coasted carbon steel.

PART 3 EXECUTION

3.01 GENERAL

A. See Section 33 10 05 – Basic Piping Materials and Methods.

3.02 DUCTILE IRON PIPE INSTALLATION

A. Installation practices including support spacing, compensation for expansion and contraction, and assembly shall comply with manufacturer's printed recommendations.

B. Install ductile iron piping in accordance with AWWA C600, modified as specified in Section 33 11 05.

C. Lay mechanical joint or bell and spigot pipe with 1/8 inch space between the spigot and shoulder of the pockets.

D. Polyethylene Encasement

1. Wrap ductile iron pipe and fittings to be buried with polyethylene encasement in accordance with ASTM A674 and ANSI/AWWA C105/A21.5-99.
2. Repair tears and make joints with two layers of plastic tape.
3. Provide 2 layers of encasement where indicated or noted in the pipe schedule.

3.03 TRACER WIRE CONDUCTIVITY TESTING

A. After pipe backfilling but prior to pressure testing, the Contractor shall test the tracer wire for positive conductivity along each section of tracer wire.

B. Tracer wire sections which do not show positive conductivity shall be excavated, repaired and retested.

END OF SECTION

SECTION 33 12 16

BASIC VALVE MATERIALS AND METHODS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Basic requirements for valves.

1.02 RELATED SECTIONS

A. Section 01 33 00 – Submittals

B. Section 33 10 10 – Pipe and Appurtenances

C. Section 33 12 16.23 – Electric Motor Actuators

1.03 REFERENCES

A. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):

1. B16.1 - Cast Iron Pipe Flanges and Flanged Fittings
2. B16.5 - Pipe Flanges and Flanged Fittings
3. B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges.
4. B16.34 - Valves - Flanged, Threaded, and Welding End.

B. American Society for Testing and Materials (ASTM):

1. A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
2. A167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
3. A216 - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for Higher-Temperature Service
4. A276 - Standard Specification for Stainless Steel Bars and Shapes
5. A351 - Standard Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts
6. A395 - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
7. A479 - Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
8. A515 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service

9. A516 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
10. A536 - Standard Specification for Ductile Iron Castings
11. A564 - Standard Specification for Hot-Rolled and Cold-Finished Age–Hardening Stainless Steel Bars and Shapes
12. A743 - Standard Specification for Castings, Iron-Chromium, Iron-Chromium–Nickel, Corrosion Resistant, for General Application
13. B584 - Standard Specification for Copper Alloy Sand Castings for General Applications
14. D429 - Standard Test Methods for Rubber Property-Adhesion to Rigid Substrate
15. E527 - Practice for Numbering Metals and Alloys (UNS).

C. American National Standards Institute/American Water Works Association (ANSI/AWWA):
   1. C111/A21.11 - Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe Fittings.

D. American Water Works Association (AWWA):
   1. C504 - Standard for Rubber-Seated Butterfly Valves
   2. C540 - Standard for Power-Actuating Devices for Valves and Sluice Gates
   3. C550 - Standard for Protective Interior Coatings for Valves and Hydrants

E. SSPC - Society for Protective Coatings:
   1. SSPC SP 2 - Surface Preparation Specification for Hand Tool Cleaning.
   2. SSPC SP7 - Brush-Off Blast Cleaning.
   3. SSPC SP1O - Surface Preparation Specification for Near-White Blast Cleaning.

1.04 DESIGN REQUIREMENTS

A. Pressure Rating:
   1. Suitable for service under minimum working pressures of 350 pounds per square inch gauge.

B. Valve to piping connections:
   1. Valves 3 Inch Nominal Size and Larger: Flanged ends.
   2. Valves less than 3 Inch Nominal Size: Screwed ends.

1.05 SUBMITTALS

A. Submit in accordance with Section 01 33 00.

B. Shop Drawings:

1. Submit detailed technical information relating to each valve including description of component parts, materials of construction, performance, dimensions, and weights.
2. Include manufacturers published recommendations for seating and unseating torque coefficient, dynamic torque, and bearing friction for calculation of maximum operating torque.

C. Operation and maintenance data:

1. Furnish bound sets of installation, operation, and maintenance instructions for each type of valve 4-inch in nominal size and larger. Include information on valve operators in operation and maintenance instruction manual.

D. Certificates:

1. Certified statement that proof-of-design tests were performed and all requirements were successfully met.
2. Interior Epoxy Coatings: Affidavit of compliance attesting that epoxy coatings applied to interior surfaces of butterfly valves comply with all provisions of AWWA C550.
3. Affidavit of compliance attesting valves provided comply with all provisions of AWWA C504.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Valves: Manufactured by manufacturers whose valves have had successful operational experience in comparable service.

1.07 DELIVERY STORAGE AND HANDLING

A. Protect valves and protective coatings from damage during handling and installation; repair coating where damaged.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ductile Iron: ASTM A536 Gr. 65-45-12,

B. Stainless Steel: ASTM A 167, Type 316, UNS Alloy S31 600.

C. Valve and Operator Bolts and Nuts: Fabricated of 316 stainless steel for the following installation conditions:

a. Submerged in sewage or water.
b. In an enclosed space above sewage or water.

c. In structures containing sewage or water, below top of walls.
d. At openings in concrete or metal decks.
e. Stem guides.

2. Where dissimilar metals are being bolted, a full-face flange gasket and ASTM A193 Grade B8M Type 316 stainless steel studs and nuts with a Xylan or PTFE coating shall be used.

3. Underground Bolts: Low-alloy steel in accordance with AWWA C111/A21.11.

D. Bronze and Brass Alloys: Use bronze and brass alloys with not more than 6 percent zinc and not more than 2 percent aluminum in the manufacture of valve parts; UNS Alloy C83600 or C92200 unless specified otherwise.

E. Valve Bodies: as indicated the particular valve specification:

2.02 INTERIOR PROTECTIVE LINING

A. Provide valves with the type of protective lining specified per this Section unless specified otherwise in the particular valve specification.

B. Apply protective lining to interior, non-working surfaces, except stainless steel surfaces.

C. Lining Types:

D. Fusion Bonded Epoxy Lining

1. Manufacturers: One of the following or equal:
   a. ScotchKote 134 manufactured by 3-M Company, or approved equivalent.

2. Clean surfaces to meet SSPC SP-7 or SP-10, as recommended by epoxy manufacturer.

3. Apply in accordance with manufacturer's published instructions.
   a. Lining Thickness: 0.010 to 0.012 inches except that:
   b. Lining Thickness in Grooves for Gaskets: 0.005 inches.
   c. Do not line seat grooves in valves with bonded seat.

4. Quality Control:
   a. Lining Thickness: Measured with a non-destructive magnetic type thickness gauge.
   b. Verify lining integrity with a wet sponge-testing unit operating at approximately 60 volts, or as recommended by the lining manufacturer.
   c. Consider tests successful when lining thickness meets specified requirements and when no pinholes are found.
   d. Correct defective lining disclosed by unsuccessful tests, and repeat test.

e. Repair pinholes with liquid epoxy recommended by manufacturer of the epoxy used for lining.

2.03 VALVE OPERATORS

A. Valve Operator Open Direction: Open counterclockwise.

B. Provide valves located below grade with extensions for key operation.

C. Provide automatically operated valves and gates located within the discharge structure with electric motor actuators.

2.04 CITY PROCURED EQUIPMENT

A. City Procured Equipment includes a 24-inch butterfly valve and torque tube to be installed by the Contractor as indicated on the Project Plans.

B. All City Procured Equipment is located at 4300 Llano Road, Santa Rosa. The Contractor shall coordinate pick-up of equipment with City staff. Loading, unloading and transportation of the equipment is the responsibility of the Contractor.

PART 3 EXECUTION

3.01 EXAMINATION

A. Preparation: Required Information Prior to Installation:

1. Install valves after the required submittal on installation has been accepted.
2. After flanged valves are selected, determine the face-to-face dimensions.

B. Fabricate piping to lengths taking into account the face-to-face dimensions.

3.02 INSTALLATION

A. General: Install each type of valve in accordance with manufacturers printed instructions.

B. Clean faces of flanges with wire brush or similar, insert gaskets and bolts, and tighten nuts progressively and uniformly.

C. Provide incidental work and materials necessary for installation of valves including flange gaskets, flange bolts and nuts, valve boxes and covers, concrete bases, blocking, and protective coating.

D. Where needed, furnish and install additional valves for proper operation and maintenance of equipment and plant facilities under the following circumstances:

1. Where such additional valves are required for operation and maintenance of the particular equipment furnished by Contractor.
2. Where such additional valves are required as a result of a substitution or change initiated by Contractor.

E. Install Valves with their stems in vertical position above the pipe, except as follows:
   1. Butterfly valves, gate valves aboveground, globe valves, ball valves, and angle valves may be installed with their stems in the horizontal position.
   2. Buried plug valves with geared operators shall be installed with their stems in a horizontal position.

F. Install valves so that handles and operators clear obstructions when the valves are operated from fully open to fully closed.

G. Provide adequate clearance between internal moving valve parts and adjacent appurtenances.

H. Place top of valve boxes flush with finish grade or as otherwise indicated on the Project Plans.

I. Valves with Threaded Connections:
   1. Install valves by applying wrench on end of valve nearest the joint to prevent distortion of the valve body.
   2. Apply pipe joint compound and Teflon tape on external (male) threads to prevent forcing compound into valve seat area.

J. Valves with Flanged Connections:
   1. Align flanges and gasket carefully before tightening flange bolts.
   2. When flanges are aligned, install bolts and hand tighten.
   3. Tighten nuts opposite each other with equal tension before moving to next pair of nuts.

END OF SECTION

SECTION 33 12 16.02

BUTTERFLY VALVES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Metal body butterfly valves.

1.02 RELATED SECTIONS:

A. Section 01 33 00 - Submittals

B. Section 33 11 00 – Pipe and Appurtenances

C. Section 33 12 16 - Basic Valve Materials and Methods

1.03 REFERENCES

A. Reference standards indicated in Section 33 12 16.

1.04 SYSTEM DESCRIPTION

A. Design Requirements:

1. General Purpose AWWA Butterfly Valves:
   a. Design Standard: Provide valves designed and manufactured in accordance with AWWA C504.
   b. Class: Provide butterfly valves conforming to AWWA Class 250B, unless otherwise specified.
2. Design valves and actuators for maximum operating torque, in accordance with and using safety factors required in AWWA C540, using the following values:
   a. Maximum Water Velocity: 25 feet per second with valve fully open.
   b. Maximum Pressure Differential Across the Closed Valve: Equal to the pressure class designation.
   c. Coefficient for seating and unseating torque, dynamic torque, and bearing friction in accordance with valve manufacturer's published recommendations.
3. Valve Disc: Seat in an angular position of 90 degrees to the pipe axis and rotate an angle of 90 degrees between fully open and fully closed positions.
   a. Do not supply valves with stops or lugs cast with or mechanically secured to the body of the valve for limiting the disc travel.
4. Unacceptable Thrust Bearings: Do not provide valves with thrust bearings exposed to the fluid in the line and consisting of a metal bearing surface in rubbing contact with an opposing metal bearing surface.

B. Performance Requirements:

1. Butterfly valves shall be manufactured for a full differential pressure of 350 psi. The valves shall be capable of operating at pressures of 350 psi.
2. Tight shutoff at the pressure rating of the valve with pressure applied in either direction.
3. Suitable for the following service conditions:
   a. Throttling.
   b. Frequent operation.
   c. Operation after long periods of inactivity.
   d. Installation in any position and flow in either direction.

1.05 SUBMITTALS

1. In accordance with Section 33 12 16.

PART 2 PRODUCTS

2.01 BUTTERFLY VALVES

A. Manufacturers: One of the following or equal:

1. DeZurik.
2. Henry Pratt Company.

B. Valve Body:

1. Material: Ductile Iron ASTM A536 Gr. 65-45-12,
2. Flanged: ASME/ANSI B16.1 Class 125 flanges for Class 150B valves, ASME/ANSI B16.1 Class 250 flanges for Class 250B valves

C. Disc:

1. Material shall be cast iron or ductile iron with Type 316 stainless steel edge that matches seat in valve body.
2. Secure valve disc to shaft by means of smooth-sided, taper or dowel pins, Type 316 stainless steel or Monel.
3. Extend pins through full diameter of shaft and mechanically secure in place.

D. Shaft and Bearings:

1. Shaft Seal: PTFE/Titanium and 316 Stainless Steel.
2. Shaft Material: Type 17-4 pH stainless steel, ASTM A564.
3. Shaft Bearings: PTFE Fabric with 317 Stainless Steel Backing.

E. Seats:

1. Seat Materials: EPDM seat is permanently bonded to the body.

F. Valve Packing:

1. Self-adjusting EPDM V-type packing.

G. Actuator

1. Valve actuators shall be fully grease packed and have stops in the open/closed position. The actuator shall have a mechanical stop which will withstand an input torque of 450 ft/lbs. against the stop. The traveling nut shall engage alignment grooves in the housing. The actuators shall have a built in packing leak bypass to eliminate possible leakage into the actuator housing.

2.02 COATING

A. Shop coat interior and exterior metal surfaces of valves, except as follows:

1. Interior machined surfaces.
2. Surfaces of gaskets and elastomeric seats and stem seals.
3. Bearing surfaces.
4. Stainless steel surfaces and components.

B. Surface Coatings:

1. Interior surfaces: High solids epoxy in accordance with TT-C-494A and AWWA C504.
2. Exterior Surfaces of Valves, Actuators and Accessories: High solids epoxy in accordance with TT-C-494A and AWWA C504.
3. Polished and Machined Surfaces: Apply rust-preventive compound: One of the following or equal:
   a. Houghton, Rust Veto 344.
   b. Rust-Oleum, R-9.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install valves with valve shafts horizontal, unless a vertical shaft is required to suit a particular installation, and unless a vertical shaft is indicated on the Project Plans.

B. Install pipe spools or valve spacers in locations where butterfly valve disc travel may otherwise be impaired by adjacent pipe lining, pipe fittings, valves, or other equipment.

END OF SECTION

SECTION 33 12 16.21

KNIFE GATE VALVE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes specification for square bottomed knife gate valves.

1.02 RELATED SECTIONS:

A. Section 01 33 00 - Submittals

B. Section 33 10 10 - Pipe and Appurtenances

C. Section 33 12 16 - Basic Valve Materials and Methods

D. Section 33 12 16.23 - Electric Motor Actuators

PART 2 PRODUCTS

2.01 KNIFE GATE VALVE

A. Knife gate valves shall be fabricated fully of stainless steel per (ASTM A240, type 304/304L or 316/316L) with a square bottom gate, rated for 350 psi water working pressure. Valves may be bonneted or bonnetless.

B. Valve flanges shall be drilled and tapped to ANSI B16.5, 300 pound standard with raised faces. Flange raised face shall be machined using serrated-spiral or serrated-concentric grooves with a 125-250 RMS finish.

C. Valve shall be rated for throttling flow at the full rated pressure of 350 psi.

D. Valve shall have a stainless steel square bottomed gate and integral cast stainless steel seat. The gate shall be of a design and thickness to withstand full 350 psi rated pressure without permanent deflection to the gate. Gate shall have a square bottom. Seat and gate shall have a fully machined finish for one-way shutoff. A minimum of two gate wedges shall be provided to assist seating the gate against the seat in the lower half of the valve body. Gate guides shall be provided in the upper half of the valve body.

E. Packing gland shall be cast stainless steel (CF8/CF8M) and shall have an adequate number of gland bolts to provide even tightening of the packing material by the packing gland. Packing shall be Teflon lubricated synthetic packing with a minimum of 4 rows. Packing gland bolts, studs and nuts shall be 304 stainless steel.

F. Valve actuator extension (valve yoke, torque tube, and/or floor stand) shall be constructed of grade 304 cast stainless steel. The valve actuator extension shall be the flat top design to allow bolt-on field installation or conversion of actuators without welding or machining. The valve stem shall be stainless steel with full ACME threads. Stem nut shall be bronze. Stem nut shall be enclosed by the use of a cast stainless steel retainer.

G. Valve shall be supplied with an electric motor operated valve actuator in accordance with Section 33 16 16.23

H. Valves shall be designed, manufactured and tested to MSS SP-81 standard or AWWA C520 standard.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with Section 33 12 16 – Basic Valve Materials and Methods

B. Locate the operator where it will be comfortably accessible but not interfere with movement in the vicinity.

END OF SECTION

SECTION 33 12 16.22

FIXED CONE DISPERSION VALVE – HOODED

PART 1 GENERAL

1.01 SUMMARY

A. Section includes specifications for a fixed cone valve with baffled hood that meets the general design requirements indicated herein.

B. The fixed cone valve shall be constructed of solid stainless steel fabricated construction as indicated herein.

C. The Contractor shall provide the valve, baffled hood, screws, shafts, gear box, electric motor operator, accessories, and appurtenances for the fixed cone valve specified herein and shown on the Project Plans. The fixed cone valve shall be field tested by the Contractor under the design conditions specified herein and as indicated on the Project Plans.

1.02 RELATED SECTIONS:

A. Section 01 33 00 - Submittals

B. Section 33 10 10 - Pipe and Appurtenances

C. Section 33 12 16 - Basic Valve Materials and Methods

D. Section 33 12 16.23 - Electric Motor Actuators

1.03 GENERAL PARAMETERS

A. The valve shall be designed to operate and maintain any position between fully open and fully closed and shall operate free from detrimental vibrations. Valve shall be provided with an electric motor operated valve actuator per Section 33 12 16.23 and as indicated herein. .

B. The valve shall be designed to close tight and shall operate without vibration or pitting under the specified design conditions. Design parameters for the valve shall be as follows:
   1. Maximum static head = 330 psi
   2. Minimum net available pressure = 122 psi
   3. Maximum net available pressure = 170 psi
   4. Maximum Required Discharge Flow = 77.4 cfs at 100% fully open valve operating at the minimum net available pressure.
   5. Minimum Required Discharge Flow = 7.7 cfs operating at the maximum net available pressure.

C. The valve shall be suitable for frequent operation and for operation after long periods of being idle. The valve shall be capable of operating under all head and flow conditions specified herein.

D. The valve shall be 12-inches in diameter and will be designed for the discharges as noted above. The valve should be operable under a normal pressure of 122 psi to 170 psi and a maximum pressure of 350 psi. Performance curves shall be furnished for the valve showing the expected discharge rates in cubic feet per second for a pressure rating varying between 122 psi and 170 psi, with the valve opening varying from 10 percent to full open in increments of 10 percent. The valve and hood shall be designated to fit into the available space as shown on the Project Plans.

E. Opening and closing time for the valve shall be between 4 and 6 minutes.

F. The valve walls and vanes shall be designed using the guidelines presented in the report, "Vane Failures of Hollow-Cone Valves," by Albert G. Mercer, 1970, International Association for Hydraulic Research Symposium, Stockholm, paper G4. The design shall take into account the maximum flow condition as determined by the Contractor's valve discharge coefficient at any open condition, at any static pressure up to the maximum possible indicated above. Each valve shall have a vibration parameter equal to or less than 0.115 based on the following equation:

$$\text{Mercer's Parametric Coefficient - C} = \frac{\mathbf{Q}/(\boldsymbol{C_v}\times\boldsymbol{D}\times\boldsymbol{T_v})}{\sqrt{(\boldsymbol{E}/\boldsymbol{\rho})}}$$

Taken from the above reference where;

Q = Maximum discharge, cfs

Cv = Coefficient depending on number of vanes and ratio of shell thickness to vane thickness

D = Nominal diameter of valve, feet

T_v = Vane thickness, feet

E = Young's modulus of elasticity, psf

ρ = Mass per unit volume, slugs/ft3

G. Each valve shall be complete with all parts and components specified and/or required for operation, installation, and maintenance including items and devices not specifically called for in these specifications but necessary to

provide a complete and operational valve. Each valve will consist of the following main parts:

1. Valve body
2. Sliding valve gate which operates over the valve body
3. Baffled hood
4. Operating and driving mechanism
5. Seals
6. Upstream flange for mounting to upstream wall flange

H. Furnish lifting eyes, lugs, and other attachments, as required, for handling and installation.

I. Contractor shall be responsible for reviewing the Specifications and Project Plans, and furnishing equipment and equipment components that can be accommodated within these limitations. Contractor shall specifically note the size of the access openings in the discharge structure for lifting/lowering the valve.

J. Detailed manufacturing production drawings shall be provided to the Engineer.

K. The valve shall be used to control and regulate the free discharge of water into atmosphere. The valve will normally be pressurized.

L. The leakage rate through the seats shall not exceed 0.4 oz./per minute per inch of valve diameter. The valves shall be capable of withstanding temperatures in the range of -30°F to +120°F.

M. The valves shall be designed to operate and maintain any position between fully open and fully closed. The valve and baffled hood shall be free from detrimental vibrations. The valve shall be provided with an electric motor operated actuator mounted directly above the valve as shown on the Project Plans. Stem extension, torque tube, floor stand, guide brackets, and/or accessories shall be supplied as necessary to supply to actuator on the surrounding structure as indicated on the Project Plans.

N. Fixed cone valve shall be provided with an integrally attached discharge hood mounted (bolted) to the downstream end of the sliding (moveable) valve gate and shall move with the valve gate. The hood shall be designed/constructed with baffles to reduce the discharge spray and exit velocity by approximately 50 percent over a non-hooded valve. Valve manufacturer shall provide baffle design and calculations which support the design of the baffled hood. The hood shall confine the exiting water discharge and shall be open to atmosphere on the discharge end only to prevent splash back onto the valve. Hood shall redirect the exiting water discharge from the valve into a cylindrical spray pattern.

1.04 DESIGN

A. Contractor shall assume full responsibility for the design, fabrication, manufacturing, inspection, shop testing, and furnishing of the fixed cone valve, baffled hood, and actuators in accordance with the specifications and Project Plans. The design and fabrication of all valve and baffled hood shall be supplied by the same company. The design stresses and factors of safety used throughout the design shall be proven in practice and the design stresses shall be equal to or lower than specified herein.

B. The maximum unit tensile or compressive combined stress in any material under the worst case condition, except where otherwise specified, shall not exceed 33 percent of the minimum yield strength or 20 percent of the minimum ultimate strength required by the applicable specification for the material. Maximum shear stresses shall not exceed 60 percent of the allowable stress in tension, except that maximum torsion shear stress in shafts shall not exceed 50 percent of the allowable stress in tension. Confirmation of the design criteria shall be submitted.

C. The valve shall be used to control and regulate the free discharge of water into atmosphere during releases. The valve will normally be pressurized by the available head in the pipeline. The valve will be located within the discharge structure and exposed to the atmosphere as indicated on the Project Plans.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fixed cone valve shall be manufactured by one of the following or an approved equivalent:

1. Ross Valve Mfg., Co., Inc.,
2. Hilton Valve
3. Henry Pratt Company

B. Fixed Cone Manufacturer must provide a complete system, including valve, electric motor operated actuator, baffled hood, etc., and is responsible for ensuring that all system components are fully compatible and meet specification requirements.

2.02 VALVE CONSTRUCTION

A. Valve Body

1. Valve body shall consist of a cylinder, a fixed internal deflector cone on the downstream end, internal radial vanes and an upstream flange for attachment to a tapped wall flange indicated on the Project Plans. The internal vanes and deflector cone shall extend beyond the downstream

end of the valve body cylinder a sufficient distance to permit the rated discharge capacity and to eliminate the possibility of the flow control point shifting from the end of the sliding valve gate onto the end of the body cylinder. The vanes shall be of constant thickness through the waterway and their leading edges shall be contoured to eliminate vibrations and shall be stainless steel, not less than 1/8” thick. The thickness of the radial ribs shall be designed based on the Mercer coefficient, but shall not be less than 3 percent or more than 5 percent of the valve inside diameter. The vanes for the fixed cone valve shall be oriented such that there are no vanes in the vertical plane.

2. The sealing and sliding surfaces of each valve body shall be stainless steel. Bearing surfaces of the body upon which the valve gate will slide shall be stainless steel.
3. Each valve flange shall be structurally adequate to support the entire valve assembly under all conditions of operation when bolted to the wall flange. The valve body flange shall be drilled in accordance and pressure rated to the water working pressures indicated herein.
4. Flanges shall be flat faced and finished to true plane surfaces within a tolerance limit of 0.005 inch. Each finished face shall be perpendicular to the longitudinal axis of the valve within a maximum angular variation tolerance of 0.002 inch per foot of flange diameter. Flange faces shall be provided with an O-ring groove. O-rings shall be provided.

B. Sliding Valve Gate
   1. Bearing surfaces on the gate which slide upon the valve body shall be bronze to provide a stainless steel on bronze sliding contact bearing surface. The gate cylinder shall be sufficiently flanged or ribbed to provide both rigidity and a place for mounting the operating screw stems and the threaded nuts.

C. Integrally attached Baffled Discharge Hood
   1. Hood shall be integrally attached to downstream end of the valve gate. The hood exterior shall be provided with radial ribs for rigidity and to resist vibration and secondary stresses. Hood interior shall be provided with radial ribs equal in number and in line with valve body ribs (vanes) to provide structural and hydrodynamic stability. Hood shall be bolted to valve gate and supported by a stainless steel shaft extending from valve body at horizontal centerline of valve/hood. The hood shall incorporate interior baffles to reduce the discharge spray and exit velocity by approximately 50 percent over a non-hooded valve.

D. Lifting Support
   1. Furnish lifting lugs for connection to crane hook to allow for installation.

E. Seating Surfaces
   1. The valve body shall have a removable stainless steel seat attached with gasket and stainless steel bolts to the downstream end of the valve body.
   2. The downstream end of the gate shall be provided with a replaceable stainless steel seat, machined to a contour to provide a satisfactory hydraulic profile. The upstream end of the gate shall be machined to receive a U-shaped packing or other appropriate seal shape which has demonstrated long-term successful operation to seal between the gate and the valve body. The seal shall always slide upon a stainless steel surface finished for long seal life. The seal shall be retained with a bronze or stainless steel gland and fasteners.

F. Materials
   1. Materials used in the manufacture of the fixed cone valve shall be as follows:
      a. Body Inlet Flange - Stainless Steel, ASTM A240, Type 304/304L or 316/316L
      b. Body Cylinder Tube - Stainless Steel, ASTM A240, Type 304/304L or 316/316L
      c. Body Ribs/Vanes - Stainless Steel, ASTM A240, Type 304/304L or 316/316L
      d. Body Nose Cone/End Flange - Stainless Steel, ASTM A240, Type 304/304L or 316/316L
      e. Gate - Stainless Steel, ASTM A240, Type 304/304L or 316/316L
      f. Hood - Stainless Steel, ASTM A240, Type 304/304L or 316/316L
      g. Hood Bushing - Bronze, ASTM B584, C86300 or fiberglass wound Teflon lined.
      h. Power Screw Stems - Stainless Steel, ASTM A276, Type 304/304L or 316/316L
      i. Body/Gate Seat (Seal) Rings - Stainless Steel, ASTM A240, Type 304/304L or 316/316L
      j. Thrust Nuts - Bronze, ASTM B584, C86300

G. Operating Gear Unit
   1. The operating gear unit for each valve shall consist of two threaded nuts, two jacking screw stems, two bevel gear reducers mounted to the valve body, 1 triple pinion bevel gear box, drive shafts and one vertical shaft extending into the actuator mounted above the valve. Operating shafts shall not extend through the waterway. The threaded nuts shall be made of bronze and shall be machined and drilled on their bases for bolting to the upstream end of the gate at points diametrically opposite each other on the centerline of the valve. They shall be accurately threaded to fit the jacking screw stems.
   2. The jacking screw stems shall be made of rolled or cut ACME threaded stainless steel and shall extend from the bronze nuts, mounted on the

upstream end of the valve gate, into the bevel gear reducers mounted on the valve body. A means for adequate grease lubrication of the screw stems shall be provided. The equipment shall be designed to be located in a wet environment. The screw shall be designed such that if the gate encounters additional forces when operating, the operator will trip out on overload protection and the means of retaining the screw to the bevel gear will not fail.

3. A stainless steel pipe cover shall be provided on the valve gate to enclose the jacking screw stems when the gate is opening. These covers shall be enclosed on one end and shall be threaded on the opposite end for screwing into a tapped hole in operating nuts. The pipe covers shall be equipped with button head grease fittings to supply grease to the screw stems.
4. The bevel gear reducers shall consist of cast iron housings suitable for a wet environment, with gaskets or “O”-ring seals. The gears and bearings shall be designed for operation in grease at the specified minimum temperature, and the necessary lubrication parts and fittings shall be provided.
5. The triple pinion bevel gear box shall consist of cast-iron housing and cover plate enclosing the three machine-cut steel bevel gears for the transmission of torque from the operating equipment into the bevel gear reducers and screw stems. Each bevel gear shall rotate on a ball thrust bearing. Two of the bevel gears shall be keyed on the bevel gear shafts rising obliquely from the bevel gear reducers and one miter gear on the lower end of the shaft extending down from the operating equipment. The triple pinion bevel gear box shall be watertight and shall be machined and drilled on its base for mounting on the top of the valve body and shall be aligned in the same plane normal to the axis of the valve as the bevel gear reducer.
6. All shafts connecting the gear reducers and the actuator shall be made of stainless steel, and shall be provided with all necessary universal joints and/or couplings and coupling bolts, to facilitate ready dismantling of the operating gear units and the actuator. All universal joints, couplings and fasteners shall be stainless steel.

2.03 ELECTRIC MOTOR OPERATED VALVE ACTUATOR

A. Electric motor operated valve actuators shall comply with Section 33 12 16.23.

PART 3 EXECUTION

3.01 FACTORY SHOP TESTING REQUIREMENTS

A. General
   1. The fixed cone valve and operator shall be fully assembled and tested in the shop prior to shipment.

2. Contractor shall furnish all necessary labor, material, and equipment, including test bulkheads, water, pumps, piping, and calibrated pressure gauges and other measuring instruments.
3. For all testing, the valve, together with the operator, shall be completely assembled and set up in the shop in the approximate position it will assume in service.

B. Hydrostatic Test
1. The valve body shall be tested under an internal hydrostatic pressure equal to 150 percent of the maximum static head for a period of not less than 30 minutes.
2. Pressure sealing bulkhead(s) shall be bolted to the valve flange(s) using the gasket(s), in such a manner that the valve body between the flange and the conical deflector will be in tension during the hydrostatic test for the fixed-cone valve.
3. No external restraints will be allowed to hold the fixed-cone valve seated; however, a soft gasket may be used between seating surfaces to hold the internal pressure during this test of the fixed-cone valve.
4. There shall be no leakage from any part of the valve except the valve seats.

C. Leakage Testing
1. For the leakage test, the completely assembled fixed-cone valve will be closed, using only the manual operator. Internal hydrostatic pressure equal to the maximum static head shall be maintained during this test for 15 minutes, during which time the leakage through the seat shall not exceed 0.4 fluid ounces per minute per inch of valve diameter. No leakage will be permitted through the packing gland(s).

D. Shop Performance Testing
1. After completion of the hydrostatic pressure test, the valve shall be operated under a no-flow condition, from the fully closed to the fully open position, and back to the fully closed position a minimum of 3 cycles. During the test, the valve shall operate satisfactorily, showing no evidence of galling or wear at any friction point, and all moving parts shall be checked for proper operation including the force required to operate the valve.

3.02 INSTALLATION

A. Install valve in accordance with Section 33 12 16 – Basic Valve Materials and Methods.

B. Valve Installation
1. The Fixed Cone Valve shall be installed as directed by the valve manufacturer and shall be mounted onto the proposed wall flange as indicated on the Project Plans.

2. All appurtenant materials required for the fixed cone valve installation shall be supplied by the Contractor.
3. The manufacturer's suggested installation procedure shall be submitted for approval including the torque specifications and procedure for mounting the flange bolts.

3.03 FIELD TESTING

A. Valve field testing will be performed in accordance with the following minimum requirements:

1. Testing Valve prior to Pressurization
   a. Operate each the valve manually at least three times before filling the pipeline with water.
   b. Fill the pipeline with water.
   c. Check for any leakage through the valve seals. Make any necessary repair or adjustments.
2. Valve Testing Under Pressurized Conditions
   a. Operate the valve through a minimum of three opening and closing cycles.
   b. Continue to check for smooth operation of the valve operating mechanism during the operating cycles.
   c. Note any vibration at any of the opening and closing positions, if any.
   d. Verify any seal leakage after each closing sequence.

END OF SECTION

SECTION 33 12 16.23

ELECTRIC MOTOR ACTUATORS

PART 1 GENERAL

1.01 SUMMARY

A. Electric motor actuators for valves shall be as indicated on the Project Plans and described in these specifications.

B. Valves supplied with electric motor actuators shall be as indicated on the Project Plans and as indicated herein:

1. 12” Fixed Cone Dispersion Valve – Positioning duty multi-turn with 4-20 mA positioner to drive the valve to any position.
2. 12” Knife Gate – Positioning duty with 4-20 mA positioner for On/Off Service to generally drive the valve through its entire travel from fully open to fully closed.

1.02 RELATED SECTIONS

A. Section 26 05 00 – Common Work for Electrical

B. Section 33 12 16 – Basic Valve Materials and Methods

C. Section 33 12 16.21 – Knife Gate

D. Section 33 12 16.22 – Fixed Cone Dispersion Valve – Hooded

1.03 ACTUATOR FEATURES

A. Motor Voltage – 460 VAC / 3ph / 60HZ

B. 15 Minute Class Motor (Positioning Duty) in compliance with IEC 60034-1 and EN 15714-2 and rated for up to 60 starts per hour.

C. Space Heater – Limit Switch Compartment

D. 2 Gear Train Limit Switch – 8 contacts

E. Open and Close Torque Switches

F. 3 Push Buttons (Open/Close/Stop)

G. Reduction Gearing

H. Mechanical Dial Position Indicator

I. Adjustable Travel Stops

J. Side Mounted Hand Wheel

K. Valve Actuator Extension

L. Plug and Socket Terminals

M. NEMA 4X Enclosure (Submersible, 6 Feet for 30 Minutes)

N. Blank A Drive Nut

O. 3 Indicator Lights (Open/Fault/Close) 110 VAC

1. Control logic for the indicator lamps shall be integral to the actuator.

P. Selector Switch (Local/Off/Remote)

Q. Open and Close Speed Control.

R. Remote Control.

1.04 SUBMITTALS

A. Product data sheets for operator make and model indicating size specific to each valve.

B. Manufacturer's standard data sheet, with application specific features and options clearly identified.

C. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.

D. Power and control wiring diagrams, including terminals and numbers.

E. Sizing calculations to substantiate the selection of, and for approval of the proposed operator for each valve. Calculations shall be readily checkable and detailed. A computer printout of just the critical torque values will not be acceptable.

1.05 OPERATING REQUIREMENTS

A. Electric motor operated valve actuators shall be designed to meet EN-15714 and AWWA C542.

B. Electric motor operated valve actuators shall have a rated torque capacity capable of opening and closing the valve at the rated differential pressure plus a factor of safety.

C. Actuators shall be capable of holding the valve in any position from fully closed to fully open without drift. Actuator shall be capable of operating the valve at the maximum static pressure and maximum operating pressure at the maximum flow rate.

D. Operating torques and loads shall be provided by the valve manufacturer and coordinated with the operator manufacturer for sizing.

E. Actuators shall include manual override hand wheel operation. Hand operation shall be engaged using a hand/auto selection lever with the drive being restored to power automatically by starting the motor. Manual handwheel shall require no more than 40 lbs. rim pull to operate valve at the maximum static pressure and maximum operating conditions specified elsewhere.

F. Actuator shall be designed with an appropriate gearing ratio.

G. Actuator shall be capable of functioning in an ambient temperature ranging from minus -30°F (-30°C) to +120°F (+70°C).

H. Locate the crank operator where it will be comfortably accessible but not interfere with movement in the vicinity.

I. Actuator shall have a mechanical position indicator with servo card to follow 4-20 mA input signal and a 4-20 mA output signal proportional to valve position.

PART 2 PRODUCTS

2.01 GENERAL

A. Actuators shall be constructed for dependable and lasting performance utilizing corrosion resistant stainless steel and/or bronze stem, gears, and bearings.

B. Actuators shall be machined and drilled for mounting on the top of a valve extension as indicated on the Project Plans.

C. Actuator and extensions shall be fully sported on the surrounding structure by use of a torque tube, yoke, floor stand, guide brackets, and/or accessories as indicated on the Project Plans.

1. Floor stand, torque tubes and yokes shall be constructed of cast 304 stainless steel unless noted otherwise.
2. Stem extensions, guide brackets, mounting hardware, and accessories shall be constructed of grade 316 stainless steel unless noted otherwise.

D. Extensions be flat top design to allow bolt-on field installation or conversion of actuators without welding or machining.

E. The valve stem shall be stainless steel with full ACME threads. Stem nut shall be bronze. Stem nut shall be enclosed by the use of a cast stainless steel retainer.

F. Gearing shall be totally enclosed in an oil-filled gear case suitable for operation at any angle. Power transmission shall be completely bearing supported and consist of a hardened alloy steel worm and bronze alloy worm gear. All other gears and components associated with the primary output drive shall be manufactured from appropriate alloy steels. A thrust base attached to the bottom of the actuator shall incorporate thrust bearings of the ball or roller type and the design should be such as to permit the gear case to be opened for inspection or disassembled without releasing the stem thrust or taking the valve out of service.

G. Handwheel shall be cast-iron with a 2 inch square drive nut.

H. Handwheel, selector switch, and cover shall be pad lockable in any position. Padlocks shall be heavy-duty, with bodies machined from a single piece of brass, and stainless steel shackles.

I. Except where otherwise specified, interior and exterior coatings for valve operators and accessories shall be in accordance with AWWA C550.

2.02 MANUFACTUTER

A. All electric motor valve actuators supplied for the project shall be from a single manufacturer.

B. Motor driven actuators shall be IQ as manufactured by Rotork Controls, MX as manufactured by Flowserve (Limitorque) Corporation, SA as manufactured by AUMA Actuators Inc., or approved equivalent.

PART 3 EXECUTION

3.01 GENERAL

A. Install actuators in accordance with Section 33 12 16 – Basic Valve Materials and Methods

B. Install valve actuators per the valve and operator manufactures written instructions and as indicated on the Project Plans.

END OF SECTION

SECTION A

SONOMA WATER REVOCABLE LICENSE

Contractor shall obtain a revocable license from the Sonoma Water (formally known as Sonoma County Water Agency (SCWA)). A copy of the City's Revocable License with SCWA is attached for information and assistance.

Instructions and application forms for obtaining a Revocable License from Sonoma Water can be found at www.sonomawater.org/revocable-license.

SONOMA COUNTY WATER AGENCY

REVOCABLE LICENSE

LICENSEE:
Santa Rosa, City of
69 Stony Point Rd.
Santa Rosa, CA 95401

TELEPHONE:
Jill Scott, (707) 543-4246 - jscott@srcity.org

PROJECT DESCRIPTION/LOCATION:
Santa Rosa Creek - Reach 1 - To allow for vehicle access to the City of Santa Rosa's Delta Pond.

LICENSE NUMBER: 2265

FACILITY/PROPERTY: Santa Rosa Creek Reach 1

EFFECTIVE DATE:

EXPIRATION DATE: July 16, 2024

This Revocable License is made by and between the Sonoma County Water Agency (Water Agency), a body corporate, and Santa Rosa, City of (Licensee).

RECITALS

A. Licensee desires to access ~~on~~ Water Agency's property to allow for vehicle access to the City of Santa Rosa's Delta Pond as described in the application for a Revocable License dated June 18, 2019, and

B. Water Agency is willing to allow Licensees to use its property on the terms and conditions provided for herein, and

C. Licensee accepts and agrees to be bound by all said terms and conditions and expressly acknowledges Water Agency's right to revoke this license and terminate Licensee's use at any time.

LICENSE

1. License. Water Agency hereby grants Licensee a License, subject to all the terms and conditions of this License, to use that portion of Water Agency's property described in Paragraph 2 below.

2. Property. Licensees are hereby permitted to use a portion of the Water Agency's property (herein the property) described in the instruments recorded on APN: 130-210-028 Document: 2231-973, APN: 130-040-014 Document: 2184-653, Official Records of Sonoma County, California, and as shown on Exhibit "A" attached hereto.

3. Non-Exclusive License. The License herein granted is non-exclusive. Water Agency continues to maintain and control the property including, without limitation, leasing and granting of additional licenses.

4. Term. This license shall remain in full force and effect until expired, terminated, or canceled pursuant to Paragraphs 20 or 22.

5. Consideration. Licensee's satisfactory performance of the terms and conditions of this License shall constitute the sole consideration due Water Agency hereunder.

6. Use. The property shall be used for the following specified purpose(s) and for no other purpose(s) without prior written consent of the Water Agency:

   A) Use of Water Agency's property to allow for vehicle access to the City of Santa Rosa's Delta Pond, all as described in the application for a Revocable License dated June 18, 2019.

7. Specified Provisions, Modifications, and Maintenance Obligations. All conditions authorized shall be complete in accordance with the provisions attached hereto, including Exhibit "B," and incorporated herein.

   A) Licensee shall use the maintenance road on Santa Rosa Creek as described in the Use, Paragraph 6, in a safe condition, on the property, at Licensee's sole cost and expense, during the term of this License.

8. Taxes. Licensee agrees to pay any and all lawful taxes, assessments, or charges, which may at any time be levied by any public entity upon any improvements made as a result of this License, or any possessory interest, which Licensee may have under this License.

9. Possessory Interest. Licensee expressly recognizes and understands that this License may create a possessory interest subject to property taxation and that Licensee may be subject to the payment of property taxes levied on such interest.

10. Compliance with Laws. Licensee has represented to Water Agency and hereby warrants that Licensee has complied with all laws applicable to the acceptance and use of the License herein granted. Licensee shall observe and comply promptly with all applicable federal, state, and county statutes and ordinances, and with all rules, regulations, directives, and orders of appropriate government agencies now in force or which may hereafter be in force, relating to or affecting the use of the License herein granted.

11. Waste; Nuisance. Licensee shall not commit, suffer, or permit the commission by others of any waste or nuisance on the premises; nor shall Licensee commit, suffer, or permit the commission by others of any action or use of the premises which interferes or conflicts with the use of the premises by Water Agency or any authorized person; nor shall Licensee commit, suffer, or permit the commission by others of any action on the premises in violation of any laws or ordinances.

12. Inspection. Water Agency shall be permitted to enter and inspect the property, at any and all times.

13. Extent of Grant of License. This Revocable License is valid only to the extent of Water Agency's rights as owner of the property. Acquisition of any other necessary permits or entitlement for use is the responsibility of Licensee. NOTHING CONTAINED IN THIS LICENSE SHALL BE CONSTRUED AS A RELINQUISHMENT OF ANY RIGHTS NOW HELD BY WATER AGENCY.

14. Bankruptcy. In the event of bankruptcy of Licensee or writ of attachment or execution against Licensee, this License shall, at the option of the Water Agency, immediately terminate.

15. Non-Liability of Water Agency. Water Agency, its officers, agents, and employees shall not be liable to Licensee for any loss or damage to Licensee or Licensee's property from any cause. Licensee expressly waives all claims against Water Agency, its officers, agents, and employees for injury or damage to person or property arising for any reason regardless of whether or not there is concurrent passive or active negligence of Water Agency, its officers, agents, and employees, unless such injury or damage is caused by or due to the sole negligence or willful misconduct of Water Agency, its officers, agents, and employees.

16. Indemnification. Licensee expressly agrees to indemnify, defend, protect, release, and hold Water Agency, its officers, agents, and employees free and harmless from and against any and all claims, demands, penalties, disabilities, damages, expenses, losses or liabilities of any kind or nature whatsoever asserted by any person or entity which Water Agency, its officers, agents and employees may sustain or incur or which may be imposed upon them or any of them for injury to or death of persons or damage to property arising out of or resulting from the alleged acts or omissions of Licensee, its officers, agents, and employees or in any manner connected with this License herein granted, or with the occupancy, use, or misuse of the property by Licensee, its officers, agents, and employees, patrons, or visitors regardless of whether or not there is concurrent negligence of Water Agency, but excluding liability due to the sole negligence or willful misconduct of Water Agency, its officers, agents, and employees. This indemnification obligation is not limited in any way by any limitation on the amount or type of damages or compensation payable to or for Licensee under Workers' Compensation acts, disability benefit acts, or other employee benefit acts.

17. Liability for Loss or Damage to Water Agency and Related Works. Licensee shall be liable for any loss or damage to Water Agency and related works, resulting from the acts or omissions of Licensee, its officers, agents, contractors, and employees. Licensee shall, upon written notice, immediately repair any such damage. Should Licensee fail to promptly make such repair, Water Agency may perform any work or have the work performed and Licensee shall immediately reimburse Water Agency for all direct and indirect costs associated with such work upon receipt of a statement therefore.

18. Water Agency Employment Practices. In the performance of this License, Licensee shall not discriminate against any employee or applicant for employment because of race, color, religion, ancestry, or natural origin. Such action shall include, but not be limited to the following: employment upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection or training, including apprenticeship.

19. Termination by Water Agency. Water Agency's Board of Directors may revoke and terminate this License for any reason whatsoever upon thirty-day prior written notice to Licensee. Water Agency's General Manager may revoke or terminate this License immediately upon written notice to Licensee for the following reasons: (a) Licensee's breach of the conditions of the license; (b) Licensee's use interferes with Water Agency use of the property; (c) Licensee's use adversely affects the Water Agency's right-of-way or facilities. Water Agency's General Manager may revoke or terminate this License upon five-day prior written notice should he determine that the property is required for Water Agency purposes or that Licensee's use of the property is inconsistent with Water Agency activities.

20. License is Personal. The License herein granted is personal to Licensee and no right hereunder may be assigned, sublet, or otherwise transferred in whole or in part without the prior written consent of Water Agency, and any attempt to assign, sublet, or transfer shall be of no force or effect whatsoever unless and until Water Agency shall have given its written consent thereto.

21. Provisions are Conditions of Use/Occupancy. Each provision of this License shall be deemed a condition of the right of Licensee to use or continue to occupy the property. If Licensee fails to perform any provision of this License at the time and in the manner herein provided, Water Agency's General Manager may, at his option, immediately terminate this License; this right to terminate is in addition to Water Agency's right to terminate pursuant to Paragraph 20 above, and shall be cumulative to any other legal right or remedy available to Water Agency.

22. Licensee to Act in Independent Capacity. Licensee, its officers, agents, and employees shall act in an independent capacity and shall not represent themselves to be or be construed to be officers, agents, or employees of Water Agency.

23. Revocable License Not a Lease. This License does not constitute a lease, but constitutes a mere Revocable License, and Licensee is limited to the use of the property expressly and specifically described in Paragraph 2. If access routes are not specifically described in Paragraph 2, above, Licensee shall be entitled to use only the access route(s) designated by the Water Agency. Licensee shall have no right or privilege in any respect whatsoever to use any other part of the property of Water Agency for any purpose whatsoever. **Licensee disclaims any interest that when coupled with the License herein granted would render it irrevocable.**

24. Notice. Any notice required or permitted to be given under this License shall be in writing. Delivery of such written notice shall be conclusively taken as sufficiently given forty-eight hours after deposit in the United States mail, registered or certified, return receipt requested, with the postage thereon fully prepaid, addressed as follows:

Water Agency:	General Manager Sonoma County Water Agency 404 Aviation Blvd Santa Rosa, CA 95403-9019
Licensee:	Santa Rosa, City of 69 Stony Point Rd. Santa Rosa, CA 95401

Either party may at any time change its address for notice by giving written notice of such change to the other party in the manner provided in this paragraph.

25. No Continuing Waiver. The waiver by Water Agency of any breach of any of the provisions of this License shall not constitute a continuing waiver or a waiver of any subsequent breach of the same, or of any other provision of this License.

26. Surrender. Upon the expiration or sooner termination of this License, Licensee shall, at its own cost and expense, remove, revise, or relocate such of its structures and equipment as is designated by Water Agency, restore the property to its condition immediately prior to the commencement date of this License, and vacate the property. Should Licensee neglect to restore the property to a condition satisfactory to Water Agency's General Manager, Water Agency may perform such work or have the work performed and Licensee shall

immediately reimburse Water Agency for all direct and indirect costs associated with such work upon receipt of a statement therefore.

27. Authority of General Manager. Water Agency's General Manager is authorized to enforce the terms and conditions of this License and to impose such additional requirements upon Licensee's use and occupation of the property as he determines necessary to protect Water Agency's use of the property. Refer to Paragraph 20 of this License.

28. Insurance. With respect to the rights granted hereunder, Licensee shall, during the term of this License, maintain and shall require all of its contractors and subcontractors to maintain insurance as described below:

A. Insurance Policies

a) **Workers' Compensation Insurance** with statutory limits as required by the Labor Code of the State of California. Said policy shall be endorsed with the following specific language:

This policy shall not be canceled or materially changed without first giving thirty-day prior written notice to the Sonoma County Water Agency.

b) **Commercial General Liability Insurance** covering bodily injury and property damage utilizing an occurrence policy form, in an amount no less than $1,000,000 combined single limit for each occurrence. Said commercial general liability insurance policy shall either by endorsed with the following specific language or contain equivalent language in the policy:

1) *The Sonoma County Water Agency, its officers and employees, are named as additional insured for all liability arising out of the operations by or on behalf of the named insured in the performance of this contract.*

2) *The inclusion of more than one insured shall not operate to impair the rights of one insured against another insured, and the coverage afforded shall apply as though separate policies had been issued to each insured, but the inclusion of more than one insured shall not operate to increase the limits of the company's liability.*

3) *The insurance provided herein is primary coverage to the Sonoma County Water Agency with respect to any insurance or self-insurance programs maintained by the Water Agency.*

4) *This policy shall not be canceled or materially changed without first giving thirty-day prior written notice to the Sonoma County Water Agency.*

c) **Automobile Liability Insurance** covering bodily injury and property damage in an amount no less than $1,000,000 combined single limit for each occurrence. Said insurance shall include coverage for owned, hired, and non-owned vehicles. Said policy shall be endorsed with the following language:

This policy shall not be canceled or materially changed without first giving thirty-day prior written notice to the Sonoma County Water Agency

B. Insurance Documentation. The following documentation shall be provided to the Water Agency:

a) Properly executed Certificates of Insurance clearly evidencing all coverage, limits, and endorsements required above. Said Certificates shall be provided prior to execution of the License by the Water Agency.

b) Signed copies of the specified endorsements for each policy.

c) Upon Water Agency's written request, certified copies of insurance policies. Said policy copies shall be provided within thirty days of Water Agency's request.

C. Insurance Policy Obligations. Licensee's indemnity and other obligations shall not be limited by the foregoing insurance requirements.

D. Material Breach. If Licensee, for any reason, fails to maintain insurance coverage, which is required pursuant to this License, the same shall be deemed a material breach of License. Water Agency, at its sole option, may terminate this License and obtain damages from the Licensee resulting from said breach. Alternatively, Water Agency may purchase such required insurance coverage, and without further notice to Licensee, Water Agency may deduct from sums due to Licensee any premium costs advanced by Water Agency for such insurance. These remedies shall be in addition to any other remedies available to the Water Agency.

30. General Provisions

A. Time of Essence. Time is and shall be of the essence of this License and of each and every provision contained in this License.

B. Incorporation of Prior Licenses; Amendments. This License contains all the Licenses of the parties with respect to any matter mentioned herein. No prior License or understanding pertaining to any such matter shall be effective. This License may be modified in writing only, signed by the parties in interest at the time of the modification, and this sentence may not be modified or waived by any oral License, whether executed or unexecuted.

C. Binding Effect; Choice of Law. This License shall be binding upon and inure to the benefit of the parties and, to the extent authorized pursuant to Paragraph 21, their personal representatives, successors, and assigns. This License shall be governed by the laws of the State of California and shall be deemed to have been entered into in the City of Santa Rosa, County of Sonoma, State of California.

D. Consents. Wherever in this License consent of one party is required to an act of the other party, such consent shall not be unreasonably withheld or delayed.

E. Rent Payable in U.S. Money. Rent and all other sums payable under this License must be paid in lawful money of the United States of America.

F. No Third Party Beneficiaries. Nothing contained in this License shall be construed and the parties do not intend to create any rights in third parties.

G. Construction of License; Severability. To the extent allowed by law, the provisions in this License shall be construed and given effect in a manner that avoids any violation of statute, regulations, or law. Water

Agency and Licensee agree that in the event any provision in this License is held to be invalid or void by any court of competent jurisdiction, the invalidity of any such provision shall in no way affect any other provision in this License. Licensee and Water Agency acknowledge that they have each contributed to the making of this License and that, in the event of a dispute over the interpretation of this License; the language of the License will not be construed against one party in favor of the other. Licensee and Water Agency further acknowledge that they have each had an adequate opportunity to consult with counsel in the negotiating and preparation of this License.

H. Relationship. The parties intend by this License to establish the relationship of Licenser and Licensee only, and do not intend to create a partnership, joint venture, joint enterprise, or any business relationship other than that of Licenser and Licensee.

LICENSEE RECOGNIZES THAT THIS LICENSE IS REVOCABLE AT ANY TIME WITHOUT CAUSE.

LICENSEE HAS CAREFULLY READ AND CONSIDERED THE TERMS AND CONDITIONS SET FORTH IN THIS LICENSE AND HEREBY AGREES THAT LICENSEE SHALL BE BOUND BY ALL SAID TERMS AND CONDITIONS.

IN WITNESS WHEREOF, the parties hereto have executed this License the day and year first written below.

LICENSEE:

Date: 8/10/19

By: _____
Authorized Representative
Sean McGlynn
City Manager

SONOMA COUNTY WATER AGENCY:

Date: 7.24.19

By: _____
Grant Davis
General Manager

CERTIFICATES OF INSURANCE
ON FILE WITH DEPARTMENT:

Date: July 16, 2019

By: Michael Tovani

c: Lavender Working File; Michael Tovani; (e-mail as attachment, no hard copy) Kevin Booker; Wendy Gjestland; Jon Niehaus; Paul Alexander; Billy Dixon

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Revised June 16, 2011

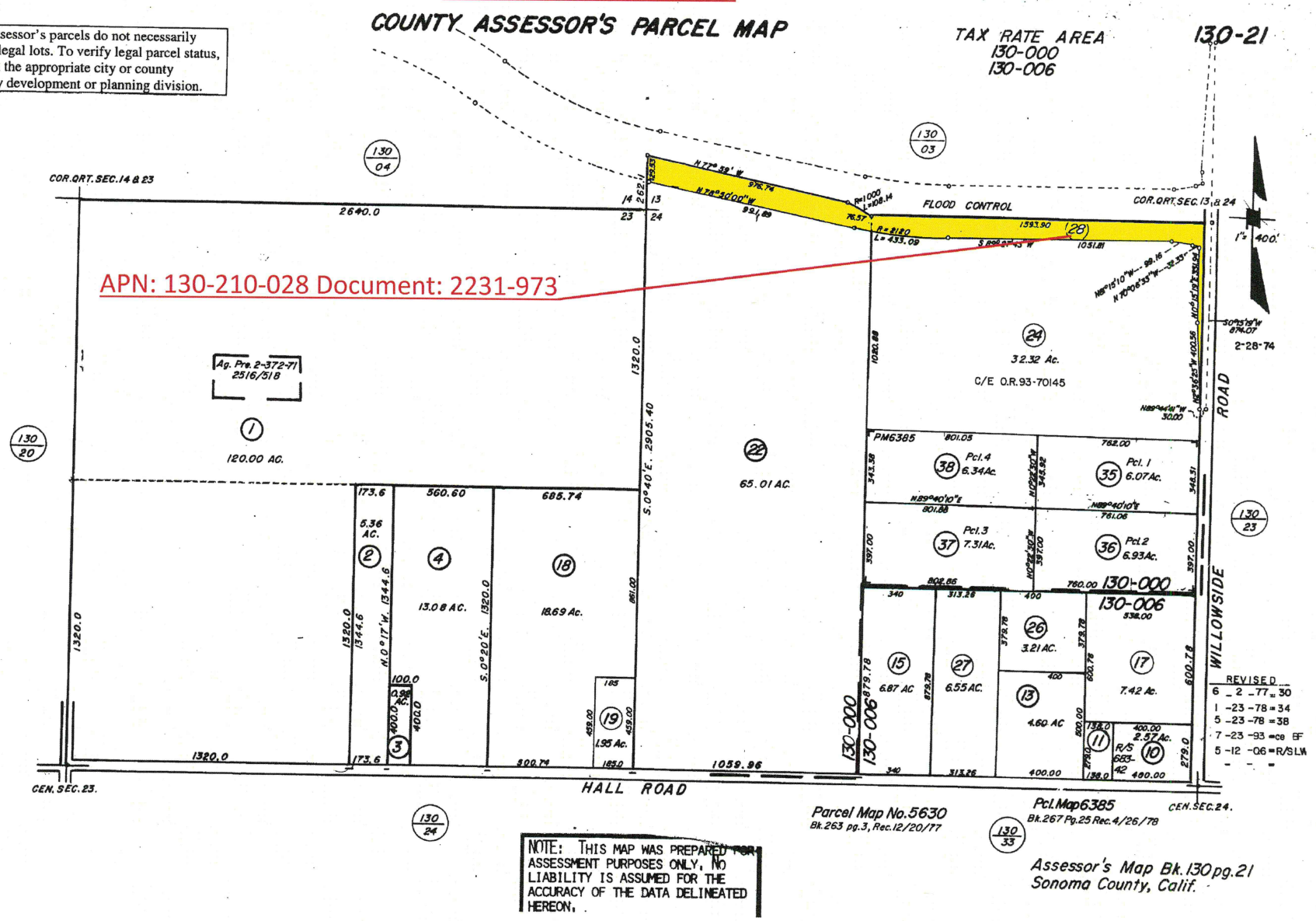
Exhibit A

See Attached

Santa Rosa Creek Reach 1

COUNTY ASSESSOR'S PARCEL MAP

NOTE: Assessor's parcels do not necessarily constitute legal lots. To verify legal parcel status, check with the appropriate city or county community development or planning division.



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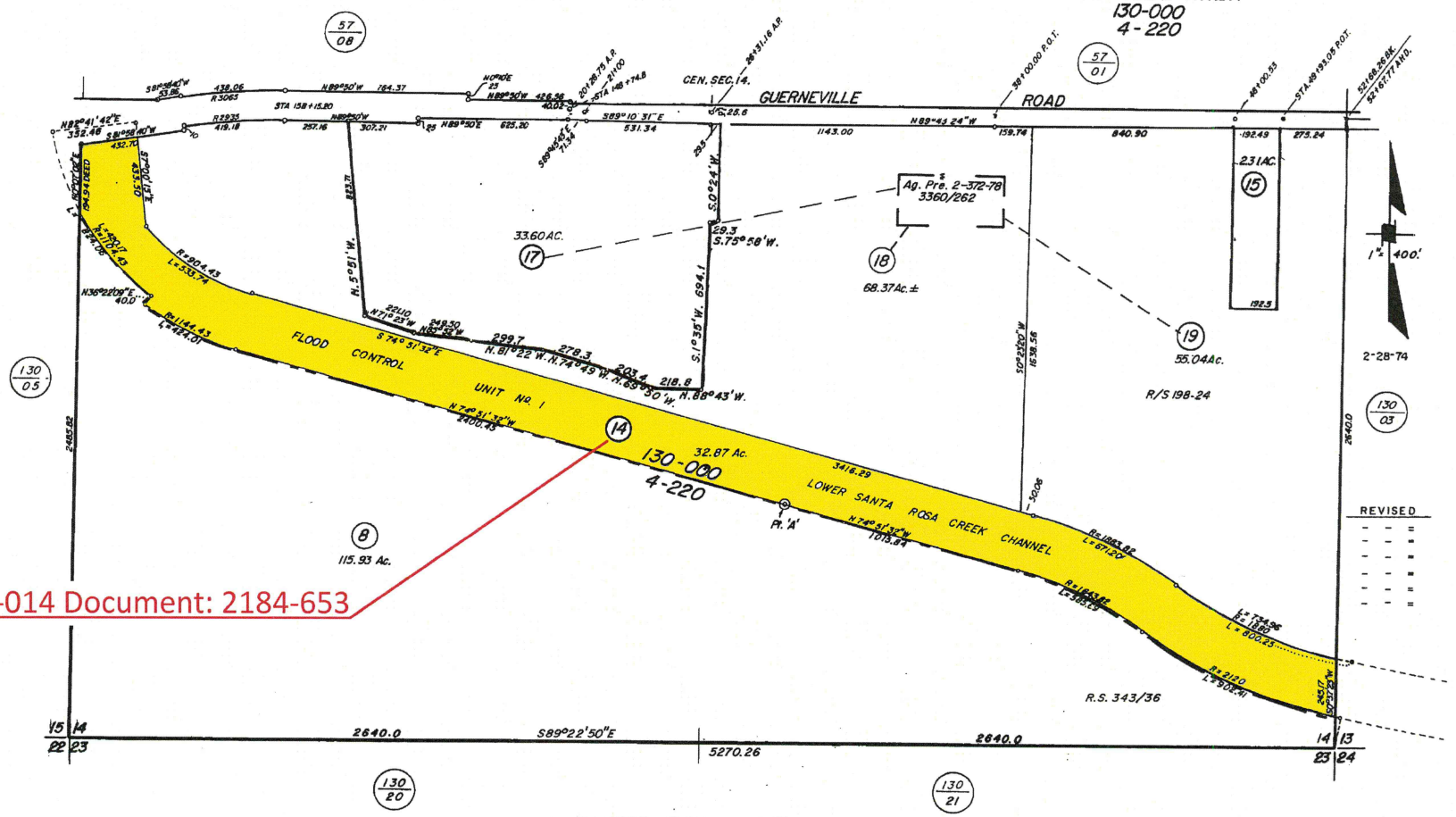
C02111

Santa Rosa Creek Reach 1

130-04

COUNTY ASSESSOR'S PARCEL MAP

TAX CODE AREA
130-000
4-220



APN: 130-040-014 Document: 2184-653

NOTE: THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY, NO LIABILITY IS ASSUMED FOR THE ACCURACY OF THE DATA DELINEATED HEREON.

Assessor's Map Bk. 130 pg. 04
Sonoma County, Calif.

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C02111

Exhibit B

(Specific Provisions Regarding Construction Activities)

MANDATORY NOTIFICATIONS:

- Notifications shall be made Monday through Thursday, 8:00 a.m. to 5:00 p.m. to Michael Tovani (707) 547-1070 mtovani@scwa.ca.gov. Failure to so notify is cause for revocation of license.
- License questions and license extensions, or when considering changes to project plans or requesting modifications to Revocable License provisions, call Michael Tovani (707) 547-1070 mtovani@scwa.ca.gov., Monday through Thursday, 8:00 a.m. to 5:00 p.m.

SPECIAL PROVISIONS: MANDATORY INSPECTIONS REQUIRED

A. All vegetative trimming must be approved by the Water Agency's Inspector.

ADDITIONAL PROVISIONS:

B. Work authorized by this license shall be in accordance with the application for a Revocable License dated June 18, 2019.

C. Licensee agrees to provide the Water Agency unrestricted access to the Water Agency's right-of-way

D. No materials or equipment shall be stored on Water Agency's right-of-way without approval of the Water Agency inspector.

E. Area shall be kept clear of trash and debris at all times.

404 Aviation Boulevard, Santa Rosa, CA 95403-9019 – (707) 526-5370 – Fax (707) 544-6123

Revocable License Number 2265

APPLICATION FOR REVOCABLE LICENSE

PLEASE PRINT

NOTE: Your application cannot be processed without complete information. Provide all information that pertains to your work or activity within Sonoma County Water Agency (Agency) properties. Processing of this application will not begin until all required information as defined in these instructions and application is accepted as complete by the Agency. **FAXED APPLICATIONS WILL BE ACCEPTED, HOWEVER, THE ORIGINAL SIGNED APPLICATION MUST BE ON FILE BEFORE THE LICENSE CAN BE ISSUED.**

APPLICATION DATE June 18, 2019

JOB ADDRESS / LOCATION (Be specific - reference cross street, project name, or landmarks.)

Access road to Delta Pond. South side of Santa Rosa Creek, west of Willowside Road.

Assessor Parcel Number(s) 130-210-028 & 130-040-014

Additional Description

APPLICANT NAME City of Santa Rosa

Contact Person Jill Scott Contractor License No.

Address 69 Stony Point Road

City/Zip Santa Rosa/95401

Telephone 707.543.4246 Fax 707.543.4281 Cellular

email jscott@srcity.org

Subcontractor Contact Name Telephone

Application for Revocable License - Continued

PURPOSE OF LICENSE (Fully describe proposed activity on Agency properties. Attach two sets of final drawings.)

Vehicle access to the City's Delta Pond Property ~~for regular maintenance purposes and construction projects Summer of 2020.~~

REQUESTED START DATE June 18, 2019 ESTIMATED COMPLETION DATE October 31, 2020

(Start date and completion date for work being performed under this application only.)

Jill Scott, Right of Way Agent

SIGNATURE (Print Name and Title)

This is only an application and does not authorize any work on Sonoma County Water Agency properties until a Revocable License is issued and signed by both Licensee and Agency.

For Agency Use Only

		Date:	By:
☑	Signed application received	7-16-2019	MP
☐	Two sets final drawings		
☑	Insurance documents complete	S&F INS	MP
☑	Preliminary Title Report	N/A	MP

Application Accepted as Complete by Michael Tourangi Date July 16, 2019

C I T Y O F S A N T A R O S A

STATE OF CALIFORNIA

GEYSERS - DELTA CONNECTION IMPROVEMENTS

The work to be performed and referred to herein is in the City of Santa Rosa, California and consists of improvements to be constructed in accordance with the provisions of the Invitation for Bids, containing the Notice to Bidders, the Special Provisions, the Project Plan(s), the Bid Forms and the Contract, all of which are by reference incorporated herein, and each Addendum, if any is issued, to any of the above which is also incorporated by reference herein.

TO THE AWARD AUTHORITY OF THE CITY OF SANTA ROSA

The undersigned, as bidder, declares that the only person or parties interested in this bid as principals are those named herein; that this bid is made without collusion with any other person, firm, or corporation; that Contractor has carefully examined the Project Plans, Invitation for Bids and conditions therefor, and is familiar with all bid requirements, that Contractor has examined this Contract and the provisions incorporated by reference herein, and Contractor hereby proposes, and agrees that if its bid is accepted by the City, Contractor will provide all necessary machinery, tools, apparatuses, and other means of construction, and to do all the work and furnish all the materials and services required to complete the construction in accordance with the Contract, the Special Provisions, the Project Plan(s), and Addenda to any of the above as incorporated by reference, in the time stated herein, for the unit prices and/or lump sum prices as follows:

CITY OF SANTA ROSA
C02111 GEYSERS DELTA CONNECTION IMPROVEMENTS
UNIT PRICE SCHEDULE

Item No.	Description	Quantity	Units	Unit Price	Total Price
1	MOBILIZE, DEMOBILIZE, AND SITE PREPARATION	1	LS	$_____	$_____
2	ARCHAEOLOGICAL AND BIOLOGICAL MONITORING COORDINATION	1	LS	$_____	$_____
3	TEMPORARY CONSTRUCTION FENCING	675	LF	$_____	$_____
4	CLEANUP AND EROSION CONTROL	1	LS	$_____	$_____
5	EMBANKMENT EXCAVATION (F)	630	CY	$_____	$_____
6	EMBANKMENT AND MISCELLANEOUS FILL (F)	730	CY	$_____	$_____
7	IMPORT MISCELLANEOUS FILL MATERIAL	250	CY	$_____	$_____
8	MAIN TIE-IN	1	LS	$_____	$_____
9	24" DUCTILE IRON PIPE, FITTINGS, AND APPURTENANCES	1	LS	$_____	$_____
10	CONCRETE PIPE ENCASEMENT	62	LF	$_____	$_____
11	24" MAG METER, VAULT, AND COVER	1	LS	$_____	$_____
12	24" BUTTERFLY VALVE	1	LS	$_____	$_____
13	12" KNIFE GATE VALVE	1	LS	$_____	$_____
14	12" FIXED-CONE DISPERSION VALVE WITH HOOD	1	LS	$_____	$_____
15	STAINLESS STEEL DISCHARGE PIPING AND APPURTENANCES	1	LS	$_____	$_____
16	DISCHARGE STRUCTURE, SPILLWAY, AND STILLING BASIN	1	LS	$_____	$_____
17	BUTTERFLY VALVE REPLACEMENT	1	LS	$_____	$_____
18	OUTLET FLOW METER REPLACEMENT	1	LS	$_____	$_____
19	ELECTRICAL FROM DELTA POND PUMP STATION TO PEDESTAL	1850	LF	$_____	$_____
20	ELECTRICAL AND CONTROLS PEDESTAL	1	LS	$_____	$_____
21	GENERAL ELECTRICAL WORK	1	LS	$_____	$_____
22	ROCK RIPRAP AND GEOTEXTILE	570	SY	$_____	$_____
23	GRAVEL ROADWAY CONSTRUCTION	860	SF	$_____	$_____
24	CHAIN LINK FENCE	72	LF	$_____	$_____
25	DEWATERING, TRENCHING SHORING, AND BRACING	1	LS	$_____	$_____
			GRAND TOTAL BID		**$**_____

In the case of any discrepancy between the unit price and the total set forth for the item, the unit price shall prevail; provided, however, that if the amount set forth as a unit price is ambiguous, unintelligible or uncertain for any reason, or is omitted, or in the case of lump sum items, is not the same amount as the entry in the "Total" column, then the amount set forth in the "Total" column for the item shall prevail in accordance with the following:

1. As to lump sum items, the amount set forth in the "Total" column shall be the unit price;

2. As to unit basis items, the amount set forth in the "Total" column shall be divided by the estimated quantity for the item and the price thus obtained shall be the unit price.

The Total Base Bid shall be the sum of the "Total" column. In case of discrepancy between the sum of the "Total" column and the amount entered as Total Base Bid, the sum of the "Total" column shall prevail. The bid comparison will be based on the sum of the "Total" column for each bidder.

If this Contract Bid is accepted by the City and the undersigned fails to execute the Contract and to give all the bonds required under the Contract, with a surety satisfactory to the Award Authority of the City of Santa Rosa, within ten calendar days after bidder has received the Notice of Award from the Engineer, then the Award Authority may, at its option, determine that the bidder has abandoned the Contract, and thereupon this bid and the acceptance thereof shall be null and void, and the forfeiture of the security accompanying this bid shall be in accordance with California Public Contract Code section 20172.

The undersigned understands and agrees that the City is not responsible for any error or omissions on the part of the undersigned in making this bid.

The bidder to whom the Contract is awarded agrees to execute the Contract in favor of the City, in the form attached, and to deliver any and all required bond(s) and insurance certificates within ten calendar days from the date of Contractor’s receipt of the Notice of Award. Following the award of the Contract, Contractor shall commence work within ten calendar days from the day authorized in the Notice to Proceed and diligently prosecute the same to completion in accordance with Section 8-1.04.

LIST OF SUBCONTRACTORS

NAME OF BIDDER: _____

The following is a list of each subcontractor who will perform work or labor or render services to the undersigned for the construction of the project in an amount in excess of ½ of 1% of the total amount of this bid.

The undersigned agrees that any portion of the work in excess of ½ of 1% of the total amount of this bid and for which no subcontractor is designated herein will be performed by the undersigned.

SUBCONTRACTOR NAME	SUBCONTRACTOR LICENSE NUMBER	SUBCONTRACTOR DIR REGISTRATION NUMBER	SUBCONTRACTOR BUSINESS ADDRESS	DESCRIPTION OF WORK (ITEM NO.)

LIST OF PREVIOUS SIMILAR JOBS

NAME OF BIDDER: _____

NONCOLLUSION DECLARATION
TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

The undersigned declares:

I am the _____ of _____, the party making the foregoing bid. The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. 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. All statements contained in the bid are true. 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, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____ [date], at _____ [city], _____ [state].

NOTE: The above Noncollusion Declaration is part of the Contract Bid. Signing this Bid on the signature portion thereof shall also constitute signature of this Noncollusion Declaration.

BID BOND AFFIDAVIT AND BIDDER'S SIGNATURE PAGE

Accompanying this bid is a guaranty in the form of (Notice: Insert the words "cash $," "Cashier's Check," "Certified Check," or "Bidder's Bond" as the case may be):

_____

in an amount equal to at least ten percent of the total of this bid.

The undersigned further agrees that if Contractor does not execute the Contract and deliver the necessary bonds to the City within the period of time specified in this Invitation for Bids, the proceeds of the security accompanying this bid shall become the property of the City of Santa Rosa, California, and this bid and the acceptance thereof may, at the option of the City, be considered null and void.

The undersigned is licensed in accordance with an act providing for the registration of Contractors, License No. _____, Class _____, expiration date _____.

The undersigned in registered with the Department of Industrial Relations, Registration No. _____.

IMPORTANT NOTICE: If bidder or other interested person is a corporation, state legal name of corporation, also names of the president, secretary, treasurer, and manager of the corporation; if a partnership, state true name of partnership, also the names of all partners in the partnership; if the bidder is a sole proprietor, state the business name and the proprietor's name in full.

Secretary of State Business Entity Number: _____.

_____

_____

_____

_____

Business Address

_____

Telephone Number

I declare under penalty of perjury that the foregoing is true and correct.

BIDDER'S SIGNATURE: _____

TITLE: _____

DATE: _____

CONTRACT

CITY OF SANTA ROSA

CALIFORNIA

CONTRACT NO. C02111
GEYSERS - DELTA CONNECTION IMPROVEMENTS

This Contract is made and entered into as of _____ at Santa Rosa, California, between the City of Santa Rosa (“City") and _____ of _____ ("Contractor").

ARTICLE I - For and in consideration of the payment and agreement hereinafter mentioned, to be made and performed by City, and under the conditions expressed in the required bonds hereunto annexed, Contractor agrees that for the benefit of City, at its own cost and expense, to do all the work and furnish all the materials, except such as are mentioned in the Special Provisions to be furnished by City, necessary to construct and complete the work herein described in a good, workmanlike, and substantial manner. The work embraced herein shall be done in accordance with the Standard Specifications of the State of California Department of Transportation, dated 2010, insofar as the same may apply (Standard Specifications); in accordance with the City of Santa Rosa Construction Specifications for Public Improvements (City Specifications); in accordance with the City of Santa Rosa Design and Construction Standards, (City Standards); in accordance with the State of California Department of Transportation Standard Plans, dated 2010 (Standard Plans), (collectively, “Contract Documents”) and in accordance with the Special Provisions hereinabove set forth, all of which are hereby incorporated into and made part of this Contract.

The work to be performed is further shown upon a plan consisting of 25 sheets entitled, Geysers - Delta Connection Improvements, File Number 2018-0048, approved by the Deputy Director of Transportation and Public Works, hereinafter referred to as the Project Plan(s).

ARTICLE II - Contractor agrees to receive and accept the following prices as full compensation for furnishing all materials and doing all the work contemplated and embraced in this Contract; also for all loss or damages arising out of the nature of the work aforesaid, or from the acts of the elements, or from any unforeseen difficulties or obstructions which may arise or be encountered in the prosecution of the work until its acceptance by City and for all expenses incurred by or in consequence of the suspension or discontinuance of work, and for well and faithfully completing the work, and the whole thereof in the manner and according to the Project Plans and Invitation for Bids therefor, and the requirements of the Engineer under them to wit:

ITEM NUMBER	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
			$ _____	$ _____

TOTAL BASE BID (SUM OF "TOTAL" COLUMN) $ _____

BID ITEMS IN THIS SECTION WILL BE INSERTED UPON AWARD OF THE CONTRACT AND SHALL BE THE SAME AS THOSE BID UPON.

ARTICLE III - City and Contractor hereby promise and agree that Contractor shall provide the materials and do the work according to the terms and conditions herein contained and referred to, for the prices aforesaid, and City hereby agrees to pay for the same at the time, in the manner, and upon the conditions set forth; and the parties for themselves, their heirs, executors, administrators, successors, and assigns, do hereby agree to full performance of the covenants herein stated.

ARTICLE IV - By execution of this Contract, Contractor hereby represents and certifies that Contractor is aware of the provisions of Labor Code section 3700 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 Contractor hereby agrees to comply with such provisions before commencing the performance of the work of this Contract.

ARTICLE V - It is further expressly agreed by and between the parties hereto that the Invitation for Bids, containing the Notice to Bidders including any required Bonds, the Contract Documents, and any Addenda are all essential parts of this Contract and are specially referred to and by such reference made a part hereof. In the event of any conflict in the provisions thereof, the terms of said documents shall control each over the other, in the following order:

1. Special Provisions
2. Project Plans
3. City Standards
4. City Specifications
5. Standard Specifications
6. Standard Plans

ARTICLE VI - Contractor agrees to commence work pursuant to this Contract within ten calendar days from the date authorized in the Notice to Proceed and to diligently prosecute the same to completion in accordance with Section 8-1.04C of the Special Provisions.

This Contract shall not be transferred or assigned without the prior written consent of City, which may be withheld by City in its sole and absolute discretion.

If Contractor is a corporation, two corporate officers of Contractor, one from each of the following two groups shall execute this Contract: a) the chairman of the board, president or any vice-president; b) the secretary, any assistant secretary, chief financial officer, or any assistant treasurer. The name and title of the corporate officers shall be printed under the signature.

In witness whereof, the parties hereto have executed this Contract as of the date first written above.

City:	**Contractor:**
City of Santa Rosa, a Municipal corporation	Name of Contractor, Type of entity
By: _____	By: _____
Title: _____	Name: _____
ATTEST: By: _____	Title: _____
Title: _____	By: _____
Approved as to form:	Name: _____
By: _____ Office of City Attorney	Title: _____