Purchasing Division

Invitation for Bid

IFB-4414-17-DH
KANNAH CREEK INTAKE REHABILITATION

Responses Due:

October 16, 2017 prior to 3:30pm

Accepting Electronic Responses Only

Responses Only Submitted Through the Rocky Mountain E-Purchasing System (RMEPS)

https://www.rockymountainbidsystem.com/default.asp

(Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor MUST contact RMEPS to resolve issue prior to the response deadline. 800-835-4603)

Purchasing Representative:
Duane Hoff Jr., Senior Buyer
duaneh@gjcity.org
970-244-1545

This document has been developed specifically to solicit competitive responses for this solicitation, and may not be the same as previous City of Grand Junction solicitations. All vendors are urged to thoroughly review this solicitation prior to responding. Submittal by **FAX, EMAIL or HARD COPY IS NOT ACCEPTABLE** for this solicitation.

Invitation for Bids

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1. Instructions to Bidders

1.1. **Purpose:** The City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for the rehabilitation of the City of Grand Junction Kannah Creek Intake. All dimensions and scope of work should be verified by Contractors prior to submission of bids.

IFB Questions:
Duane Hoff Jr., Senior Buyer
duaneh@gjcity.org

1.2. **Mandatory Site Visit Meeting:** **Prospective bidders are required to attend a mandatory pre-bid meeting on October 3, 2017 at 10:00am**. Meeting location shall be on site at 10001 Kannah Creek Road, Whitewater, CO 81527. The purpose of this visit will be to inspect and to clarify the contents of this Invitation for Bids (IFB).

1.3. **The Owner:** The Owner is the City of Grand Junction, Colorado and is referred to throughout this Solicitation. The term Owner means the Owner or his authorized representative.

1.4. **Submission:** ***Each bid shall be submitted in electronic format only, and only through the Rocky Mountain E-Purchasing website (https://www.rockymountainbidsystem.com/default.asp).*** *This site offers both "free" and "paying" registration options that allow for full access of the Owner's documents and for electronic submission of proposals. (Note: "free" registration may take up to 24 hours to process. Please Plan accordingly.)* Please view our "**Electronic Vendor Registration Guide"** at http://www.gjcity.org/business-and-economic-development/bids/ for details. (Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. **800-835-4603**)

1.5. **Modification and Withdrawal of Bids Before Opening.** Bids may be modified or withdrawn by an appropriate document stating such, duly executed and submitted to the place where Bids are to be submitted at any time prior to Bid Opening.

1.6. **Printed Form for Price Bid:** All Price Bids must be made upon the Price Bid Schedule attached, and should give the amounts both in words and in figures, and must be signed and acknowledged by the bidder.

The Offeror shall specify a unit price in figures for each pay item for which a quantity is given and shall provide the products (in numbers) of the respective unit prices and quantities in the Extended Amount column. The total Bid price shall be equal to the sum of all extended amount prices. When an item in the Price Bid Schedule provides a choice to be made by the Offeror, Offeror's choice shall be indicated in accordance with the specifications for that particular item and thereafter no further choice shall be permitted.

Where the unit of a pay item is lump sum, the lump sum amount shall be shown in the "extended amount" column and included in the summation of the total Bid.

All blank spaces in the Price Bid Schedule must be properly filled out.

Bids by corporations must be executed in the corporate name by the president or vice president or other corporate office accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown below the signature.

Bids by partnerships must be executed in the partnership name and signed by a partner whose title must appear under the signature and the official address of the partnership must be shown below the signature.

All names must be typed or printed below the signature.

The Offeror's Bid shall contain an acknowledgement of receipt of all Addenda, the numbers of which shall be filled in on the Contractor's Bid Form.

The contact information to which communications regarding the Bid are to be directed must be shown.

1.7. Exclusions: No oral, telephonic, emailed, or facsimile bid will be considered

1.8. Contract Documents: The complete IFB and bidder's response compose the Contract Documents. Copies of bid documents can be obtained from the City Purchasing website, http://www.gjcity.org/business-and-economic-development/bids/ .

1.9. Additional Documents: The July 2010 edition of the "City Standard Contract Documents for Capital Improvements Construction", Plans, Specifications and other Bid Documents are available for review or download on the Public Works & Planning/Engineering page at www.gjcity.org. Electronic copies may be obtained on a CD format at the Department of Public Works and Planning at City Hall.

1.10. Definitions and Terms: See Article I, Section 3 of the General Contract Conditions in the *Standard Contract Documents for Capital Improvements Construction*.

1.11. Examination of Specifications: Bidders shall thoroughly examine and be familiar with the project Statement of Work. The failure or omission of any Offeror to receive or examine any form, addendum, or other document shall in no way relieve any Offeror from any obligation with respect to his bid. The submission of a bid shall be taken as evidence of compliance with this section. Prior to submitting a bid, each Offeror shall, at a minimum:

a. Examine the *Contract Documents* thoroughly;

b. Visit the site to familiarize themselves with local conditions that may in any manner affect cost, progress, or performance of the Work;

c. Become familiar with federal, state, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress or performance of the Work;

d. Study and carefully correlate Bidder's observations with the *Contract Documents*, and;

e. Notify the Engineer of all conflicts, errors, ambiguities or discrepancies in or among the *Contract Documents*

On request, the Owner will provide each Offeror access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of a Bid. It shall be the Offeror's responsibility to make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (including without limitation, surface, subsurface and underground utilities) at or contiguous to the site or otherwise which may affect cost, progress or performance of the work and which the Offeror deems necessary to determine its Bid for performing the work in accordance with the time, price and other terms and conditions of the Contract Documents. Location of any excavation or boring made by Offeror shall be subject to prior approval of Owner and applicable agencies. Offeror shall fill all holes, restore all pavements to match the existing structural section and shall clean up and restore the site to its former condition upon completion of such exploration. The Owner reserves the right to require the Offeror to execute an access agreement with the Owner prior to accessing the site.

The lands upon which the Work is to be performed, rights of way, and access thereto, and other lands designated for use by Contractor in performing the Work, are identified on the Drawings.

Information and data reflected in the *Contract Documents* with respect to underground utilities at or contiguous to the site are based upon information and data furnished to the Owner and the Engineer by the owners of such underground utilities or others, and the Owner does not assume responsibility for the accuracy or completeness thereof, unless it is expressly provided otherwise in the *Contract Documents*.

By submission of a Bid, the Offeror shall be conclusively presumed to represent that the Offeror has complied with every requirement of these Instructions to Bidders, that the *Contract Documents* are not ambiguous and are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

1.12. Questions Regarding Statement of Work: Any information relative to interpretation of Scope of Work or specifications shall be requested of the Purchasing Representative, in writing, in ample time prior to the response time.

1.13. Addenda & Interpretations: If it becomes necessary to revise any part of this solicitation, a written addendum will be posted electronically on the City's website at http://www.gjcity.org/business-and-economic-development/bids/ . The Owner is not bound by any oral representations, clarifications, or changes made in the written specifications by Owner, unless such clarification or change is provided in written addendum form from the City Purchasing Representative.

1.14. Taxes: The Owner is exempt from State retail and Federal tax. The bid price must be net, exclusive of taxes.

1.15. Sales and Use Taxes: The Contractor and all Subcontractors are required to obtain exemption certificates from the Colorado Department of Revenue for sales and use taxes in accordance with the provisions of the General Contract Conditions. Bids shall reflect this method of accounting for sales and use taxes on materials, fixtures and equipment.

1.16. Offers Binding 60 Days: Unless additional time is required by the Owner, or otherwise specified, all formal offers submitted shall be binding for sixty (60) calendar days following opening date, unless the Bidder, upon request of the Purchasing Representative, agrees to an extension.

1.17. Collusion Clause: Each bidder by submitting a bid certifies that it is not party to any collusive action or any action that may be in violation of the Sherman Antitrust Act. Any and all bids shall be rejected if there is evidence or reason for believing that collusion exists among bidders. The Owner may, or may not, accept future bids for the same services or commodities from participants in such collusion.

1.18. Disqualification of Bidders: A Bid will not be accepted from, nor shall a Contract be awarded to, any person, firm, or corporation that is in arrears to the Owner, upon debt or contract, or that has defaulted, as surety or otherwise, upon any obligation to the Owner, or that is deemed irresponsible or unreliable.

Bidders may be required to submit satisfactory evidence that they are responsible, have a practical knowledge of the project bid upon and that they have the necessary financial and other resources to complete the proposed Work.

Either of the following reasons, without limitation, shall be considered sufficient to disqualify a Bidder and Bid:

a. More than one Bid is submitted for the same Work from an individual, firm, or corporation under the same or different name; and

b. Evidence of collusion among Bidders. Any participant in such collusion shall not receive recognition as a Bidder for any future work of the Owner until such participant has been reinstated as a qualified bidder.

1.19. Public Disclosure Record: If the bidder has knowledge of their employee(s) or sub-contractors having an immediate family relationship with a City/County employee or elected official, the bidder must provide the Purchasing Representative with the name(s) of these individuals. These individuals are required to file an acceptable “Public Disclosure Record”, a statement of financial interest, before conducting business with the City/County.

2. General Contract Conditions for Construction Projects

2.1. **The Contract:** This Invitation for Bid, submitted documents, and any negotiations, when properly accepted by the City/County, shall constitute a contract equally binding between the City/County and Contractor. The contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The contract may be amended or modified with Change Orders, Field Orders, or Addendums.

2.2. **The Work:** The term Work includes all labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction.

2.3. **Execution, Correlation, Intent, and Interpretations:** The Contract Documents shall be signed in not less than triplicate by the Owner (City/County) and Contractor. City/County will provide the contract. By executing the contract, the Contractor represents that he/she has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents. The Contract Documents are complementary, and what is required by any one, shall be as binding as if required by all. The intention of the documents is to include all labor, materials, equipment and other items necessary for the proper execution and completion of the scope of work as defined in the technical specifications and drawings contained herein. All drawings, specifications and copies furnished by the City/County are, and shall remain, City/County property. They are not to be used on any other project, and with the exception of one contract set for each party to the contract, are to be returned to the owner on request at the completion of the work.

2.4. **The Owner:** The Owner is the City of Grand Junction, Colorado and is referred to throughout the Contract Documents. The term Owner means the Owner or his authorized representative. The Owner shall, at all times, have access to the work wherever it is in preparation and progress. The Contractor shall provide facilities for such access. The Owner will make periodic visits to the site to familiarize himself generally with the progress and quality of work and to determine, in general, if the work is proceeding in accordance with the contract documents. Based on such observations and the Contractor's Application for Payment, the Owner will determine the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in the contract. The Owner will have authority to reject work which does not conform to the Contract documents. Whenever, in his reasonable opinion, he considers it necessary or advisable to insure the proper implementation of the intent of the Contract Documents, he will have authority to require the Contractor to stop the work or any portion, or to require special inspection or testing of the work, whether or not such work can be then be fabricated, installed, or completed. The Owner will not be responsible for the acts or omissions of the Contractor, and sub-Contractor, or any of their agents or employees, or any other persons performing any of the work.

2.5. **Contractor:** The Contractor is the person or organization identified as such in the Agreement and is referred to throughout the Contract Documents. The term Contractor means the Contractor or his authorized representative. The Contractor shall carefully study and compare the General Contract Conditions of the Contract, Specification and Drawings, Scope of Work, Addenda and Modifications and shall at once report to the Owner any error, inconsistency or omission he may discover. Contractor shall not be

liable to the Owner for any damage resulting from such errors, inconsistencies or omissions. The Contractor shall not commence work without clarifying Drawings, Specifications, or Interpretations.

2.6. Sub-Contractors: A sub-contractor is a person or organization who has a direct contract with the Contractor to perform any of the work at the site. The term sub-contractor is referred to throughout the contract documents and means a sub-contractor or his authorized representative.

2.7. Award of Sub-Contractors & Other Contracts for Portions of the Work: Contractor shall submit with their bid response to the Owner, in writing for acceptance, a list of the names of the sub-contractors or other persons or organizations proposed for such portions of the work as may be designated in the proposal requirements, or, if none is so designated, the names of the sub-contractors proposed for the principal portions of the work. Prior to the award of the contract, the Owner shall notify the successful Contractor in writing if, after due investigation, has reasonable objection to any person or organization on such list. If, prior to the award of the contract, the Owner has a reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization, the successful Contractor may, prior to the award, withdraw their proposal without forfeiture of proposal security. If the successful Contractor submits an acceptable substitute with an increase in the proposed price to cover the difference in cost occasioned by the substitution, the Owner may, at their discretion, accept the increased proposal or may disqualify the Contractor. If, after the award, the Owner refuses to accept any person or organization on such list, the Contractor shall submit an acceptable substitute and the contract sum shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued. However, no increase in the contract sum shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting a name with respect thereto prior to the award.

2.8. Quantities of Work and Unit Price: Materials or quantities stated as unit price items in the Bid are supplied only to give an indication of the general scope of the Work, and are as such, estimates only. The Owner does not expressly or by implication agree that the actual amount of Work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit item of the Work without a change in the unit price except as set forth in Article VIII, Section 70 of the *General Contract Conditions*. The City also reserves the right to make changes in the Work (including the right to delete any bid item in its entirety or add additional bid items) as set forth in Article VIII, Sections 69 through 71 of the *General Contract Conditions*.

2.9. Substitutions: The materials, products and equipment described in the *Solicitation Documents* shall be regarded as establishing a standard of required performance, function, dimension, appearance, or quality to be met by any proposed substitution. No substitution will be considered prior to receipt of Bids unless the Offeror submits a written request for approval to the City Purchasing Division at least ten (10) days prior to the date for receipt of Bids. Such requests for approval shall include the name of the material or equipment for which substitution is sought and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for evaluation, including samples if requested. The Offeror shall set forth

changes in other materials, equipment, or other portions of the Work including changes of the work of other contracts, which incorporation of the proposed substitution would require to be included. The Owner's decision of approval or disapproval of a proposed substitution shall be final. If the Owner approves a proposed substitution before receipt of Bids, such approval will be set forth in an Addendum. Offerors shall not rely upon approvals made in any other manner.

2.10. Supervision and Construction Procedures: The Contractor shall supervise and direct the work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the contract.

2.11. Warranty: The Contractor warrants to the Owner that all materials and equipment furnished under this contract will be new unless otherwise specified, and that all work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All work not so conforming to these standards may be considered defective. If required by Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. If within ten (10) days after written notice to the Contractor requesting such repairs or replacement, the Contractor should neglect to make or undertake with due diligence to the same, the City may make such repairs or replacements. All indirect and direct costs of such correction or removal or replacement shall be at the Contractor's expense. The Contractor will also bear the expenses of making good all work of others destroyed or damaged by the correction, removal or replacement of his defective work.

2.12. Permits, Fees, & Notices: The Contractor shall secure and pay for all permits, governmental fees and licenses necessary for the proper execution and completion of the work. The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the work. If the Contractor observes that any of the Contract Documents are at variance in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be adjusted by approximate modification. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility and shall bear all costs attributable.

2.13. Responsibility for Those Performing the Work: The Contractor shall be responsible to the Owner for the acts and omissions of all his employees and all sub-contractors, their agents and employees, and all other persons performing any of the work under a contract with the Contractor.

2.14. Use of the Site: The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents, and shall not unreasonably encumber the site with any materials or equipment.

2.15. Cleanup: The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of work he shall remove all his waste materials and rubbish from and about the project, as well as all his tools, construction equipment, machinery and surplus materials.

2.16. Insurance: The Contractor shall secure and maintain such insurance policies as will provide the coverage and contain other provisions specified in the General Contract Conditions, or as modified in the Special Contract Conditions.

The Contractor shall file a copy of the policies or Certificates of Insurance acceptable to the City with the Engineer within ten (10) Calendar Days after issuance of the Notice of Award. These Certificates of Insurance shall contain a provision that coverage afforded under the policies shall not be canceled unless at least thirty (30) Calendar Days prior written notice has been given to the City.

2.17. Indemnification: The Contractor shall defend, indemnify and save harmless the Owner, and all its officers, employees, insurers, and self-insurance pool, from and against all liability, suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the Contractor, or of any Contractor's agent, employee, sub-contractor or supplier in the execution of, or performance under, any contract which may result from proposal award. Contractor shall pay any judgment with cost which may be obtained against the Owner growing out of such injury or damages.

2.18. Miscellaneous Conditions: Material Availability: Contractors must accept responsibility for verification of material availability, production schedules, and other pertinent data prior to submission of bid. It is the responsibility of the bidder to notify the Owner immediately if materials specified are discontinued, replaced, or not available for an extended period of time. OSHA Standards: All bidders agree and warrant that services performed in response to this invitation shall conform to the standards declared by the US Department of Labor under the Occupational Safety and Health Act of 1970 (OSHA). In the event the services do not conform to OSHA standards, the Owner may require the services to be redone at no additional expense to the Owner.

2.19. Time: Time is of the essence with respect to the time of completion of the Project and any other milestones or deadline which are part of the Contract. It will be necessary for each Bidder to satisfy the City of its ability to complete the Work within the Contract Time set forth in the Contract Documents. The Contract Time is the period of time allotted in the Contract Documents for completion of the work. The date of commencement of the work is the date established in a Notice to Proceed. If there is no Notice to Proceed, it shall be the date of the Contract or such other date as may be established therein, or as established as entered on the Bid Form. The Date of Substantial Completion of the work or designated portions thereof is the date certified by the Owner when construction is sufficiently complete, in accordance with the Contract Documents.

2.20. Progress & Completion: The Contractor shall begin work on the date of commencement as defined in the Contract, and shall carry the work forward expeditiously with adequate forces and shall complete it within the contract time.

2.21. Payment & Completion: The Contract Sum is stated in the Contract and is the total amount payable by the Owner to the Contractor for the performance of the work under the Contract Documents. Upon receipt of written notice that the work is ready for final

inspection and acceptance and upon receipt of application for payment, the Owner's Project Manager will promptly make such inspection and, when he finds the work acceptable under the Contract Documents and the Contract fully performed, the Owner shall make payment in the manner provided in the Contract Documents.

2.22. Bid Bond: Each Bid shall as a guaranty of good faith on the part of the Bidder be accompanied by a Bid Guaranty consisting of: a certified or cashier's check drawn on an approved national bank or trust company in the state of Colorado, and made payable without condition to the City; or a **Bid Bond** written by an approved corporate surety in favor of the City. The amount of the Bid Guaranty shall not be less than 5% of the total Bid amount. Once a Bid is accepted and a Contact is awarded, the apparent successful bidder has ten calendar days to enter into a contractor in the form prescribed and to furnish the bonds with a legally responsible and approved surety. Failure to do so will result I forfeiture of the Bid Guaranty to the City as Liquidated Damages.

Each bidder shall guaranty its total bid price for a period of sixty (60) Calendar Days from the date of the bid opening.

2.23. Performance & Payment Bonds: Contractor shall furnish a Performance and a Payment Bond, each in an amount at least equal to that specified for the contract amount as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents. These bonds shall remain in effect for the duration of the Warranty Period (as specified in the Special Conditions). Contractor shall also furnish other bonds that may be required by the Special Conditions. All bonds shall be in the forms prescribed by the Contract Documents and be executed by such sureties as (1) are licensed to conduct business in the State of Colorado and (2) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Accounts, U.S. Treasury Department. All bonds singed by an agent must be accompanied by a certified copy of the Authority Act. If the surety on any bond furnished by the Contractor is declared bankrupt, or becomes insolvent, or its rights to do business in Colorado are terminated, or it ceases to meet the requirements of clauses (1) and (2) of this section, Contractor shall within five (5) days thereafter substitute another bond and surety, both of which shall be acceptable to the City.

2.24. Retention: The Owner will deduct money from the partial payments in amounts considered necessary to protect the interest of the Owner and will retain this money until after completion of the entire contract. The amount to be retained from partial payments will be five (5) percent of the value of the completed work, and not greater than five (5) percent of the amount of the Contract. When the retainage has reached five (5) percent of the amount of the Contract no further retainage will be made and this amount will be retained until such time as final payment is made.

2.25. Liquidated Damages for Failure to Enter Into Contract: CITY ONLY Should the Successful Bidder fail or refuse to enter into the Contract within ten Calendar Days from the issuance of the Notice of Award, the City shall be entitled to collect the amount of such Bidder's Bid Guaranty as Liquidated Damages, not as a penalty but in consideration of the mutual release by the City and the Successful Bidder of all claims arising from the

City's issuance of the Notice of Award and the Successful Bidder's failure to enter into the Contract and the costs to award the Contract to any other Bidder, to readvertise, or otherwise dispose of the Work as the City may determine best serves its interest.

2.26. Liquidated Damages for Failure to Meet Project Completion Schedule: CITY ONLY

If the Contractor does not achieve Final Completion by the required date, whether by neglect, refusal or any other reason, the parties agree and stipulate that the Contractor shall pay liquidated damages to the City for each such day that final completion is late. As provided elsewhere, this provision does not apply for delays caused by the City. The date for Final Completion may be extended in writing by the Owner.

The Contractor agrees that as a part of the consideration for the City's awarding of this Contract liquidated damages in the daily amount of **$350.00** is reasonable and necessary to pay for the actual damages resulting from such delay. The parties agree that the real costs and injury to the City for such delay include hard to quantify items such as: additional engineering, inspection and oversight by the City and its agents; additional contract administration; inability to apply the efforts of those employees to the other work of the City; perceived inefficiency of the City; citizens having to deal with the construction and the Work, rather than having the benefit of a completed Work, on time; inconvenience to the public; loss of reputation and community standing for the City during times when such things are very important and very difficult to maintain.

The Contractor must complete the Work and achieve final completion included under the Bid Schedule in the number of consecutive calendar days after the City gives is written Notice to Proceed. When the Contractor considers the entire Work ready for its intended use, Contractor shall certify in writing that the Work is substantially complete. In addition to the Work being substantially complete, Final Completion date is the date by which the Contractor shall have fully completed all clean-up, and all items that were identified by the City in the inspection for final completion. Unless otherwise stated in the Special Conditions, for purposes of this liquidated damages clause, the Work shall not be finished and the Contract time shall continue to accrue until the City gives its written Final Acceptance.

If the Contractor shall fail to pay said liquidated damages promptly upon demand thereof after having failed to achieve Final Completion on time, the City shall first look to any retainage or other funds from which to pay said liquidated damages; if retainage or other liquid funds are not available to pay said liquidated damages amounts, the Surety on the Contractor's Performance Bond and Payment Bond shall pay such liquidated damages. In addition, the City may withhold all, or any part of, such liquidated damages from any payment otherwise due the Contractor.

Liquidated damages as provided do not include any sums to reimburse the City for extra costs which the City may become obligated to pay on other contracts which were delayed or extended because of the Contractor's failure to complete the Work within the Contract Time. Should the City incur additional costs because of delays or extensions to other contracts resulting from the Contractor's failure of timely performance, the Contractor agrees to pay these costs that the City incurs because of the Contractor's delay, and these payments are separate from and in addition to any liquidated damages.

The Contractor agrees that the City may use its own forces or hire other parties to obtain Substantial or Final Completion of the work if the time of completion has elapsed and the Contractor is not diligently pursuing completion. In addition to the Liquidated Damages provided for, the Contractor agrees to reimburse the City for all expenses thus incurred.

2.27. Contingency/Force Account: Contingency/Force Account work will be authorized by the Owner's Project Manager and is defined as minor expenses to cover miscellaneous or unforeseen expenses related to the project. The expenses are not included in the Drawings, Specifications, or Scope of Work and are necessary to accomplish the scope of this contract. Contingency/Force Account Authorization will be directed by the Owner through an approved form. Contingency/Force Account funds are the property of the Owner and any Contingency/Force Account funds, not required for project completion, shall remain the property of the Owner. Contractor is not entitled to any Contingency/Force Account funds, that are not authorized by Owner or Owner's Project Manager.

2.28. Protection of Persons & Property: The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. Contractor shall erect and maintain, as required by existing safeguards for safety and protection, and all reasonable precautions, including posting danger signs or other warnings against hazards promulgating safety regulations and notifying owners and users of adjacent utilities. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct by the Contractor in the execution of the work, or in consequence of the non-execution thereof by the Contractor, he shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or it shall make good such damage or injury in an acceptable manner.

2.29. Changes in the Work: The Owner, without invalidating the contract, may order changes in the work within the general scope of the contract consisting of additions, deletions or other revisions, the contract sum and the contract time being adjusted accordingly. All such changes in the work shall be authorized by Change Order and shall be executed under the applicable conditions of the contract documents. A Change Order is a written order to the Contractor signed by the Owner issued after the execution of the contract, authorizing a change in the work or an adjustment in the contract sum or the contract time. The contract sum and the contract time may be changed only by Change Order.

2.30. Claims for Additional Cost or Time: If the Contractor wishes to make a claim for an increase in the contract sum or an extension in the contract time, he shall give the Owner written notice thereof within a reasonable time after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the work, except in an emergency endangering life or property in which case the Contractor shall precede in accordance with the regulations on safety. No such claim shall be valid unless so made. Any change in the contract sum or contract time resulting from such claim shall be authorized by Change Order.

2.31. Minor Changes in the Work: The Owner shall have authority to order minor changes in the work not involving an adjustment in the contract sum or an extension of the contract time and not inconsistent with the intent of the contract documents.

2.32. Field Orders: The Owner may issue written Field Orders which interpret the Contract Documents in accordance with the specifications, or which order minor changes in the work in accordance with the agreement, without change in the contract sum or time. The Contractor shall carry out such Field Orders promptly.

2.33. Uncovering & Correction of Work: The Contractor shall promptly correct all work rejected by the Owner as defective or as failing to conform to the contract documents whether observed before or after substantial completion and whether or not fabricated installed or competed. The Contractor shall bear all costs of correcting such rejected work, including the cost of the Owner's additional services thereby made necessary. If within one (1) year after the date of completion or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the contract documents, any of the work found to be defective or not in accordance with the contract documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discover of condition. All such defective or non-conforming work under the above paragraphs shall be removed from the site where necessary and the work shall be corrected to comply with the contract documents without cost to the Owner. The Contractor shall bear the cost of making good all work of separate Contractors destroyed or damaged by such removal or correction. If the Owner prefers to accept defective or non-conforming work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect an appropriate reduction in the payment or contract sum, or, if the amount is determined after final payment, it shall be paid by the Contractor.

2.30. Amendment: No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All amendments to the contract shall be made in writing by the Owner.

2.31. Assignment: The Contractor shall not sell, assign, transfer or convey any contract resulting from this IFB, in whole or in part, without the prior written approval from the Owner.

2.32. Compliance with Laws: Bids must comply with all Federal, State, County and local laws governing or covering this type of service and the fulfillment of all ADA (Americans with Disabilities Act) requirements.

2.33. Confidentiality: All information disclosed by the Owner to the Contractor for the purpose of the work to be done or information that comes to the attention of the Contractor during the course of performing such work is to be kept strictly confidential.

2.34. Conflict of Interest: No public official and/or City/County employee shall have interest in any contract resulting from this IFB.

2.35. Contract Termination: This contract shall remain in effect until any of the following occurs: (1) contract expires; (2) completion of services; (3) acceptance of services or, (4) for convenience terminated by either party with a written *Notice of Cancellation* stating therein the reasons for such cancellation and the effective date of cancellation.

2.36. Employment Discrimination: During the performance of any services per agreement with the Owner, the Contractor, by submitting a Bid, agrees to the following conditions:

2.36.1. The Contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, handicap, or national origin except when such condition is a legitimate occupational qualification reasonably necessary for the normal operations of the Contractor. The Contractor agrees to post in conspicuous places, visible to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

2.36.2. The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, shall state that such Contractor is an Equal Opportunity Employer.

2.36.3. Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.

2.37. Affirmative Action: In executing a Contract with the City, the Contractor agrees to comply with Affirmative Action and Equal Employment Opportunity regulations presented in the General Contract Conditions.

2.38. Immigration Reform and Control Act of 1986 and Immigration Compliance: The Offeror certifies that it does not and will not during the performance of the contract employ illegal alien workers or otherwise violate the provisions of the Federal Immigration Reform and Control Act of 1986 and/or the immigration compliance requirements of State of Colorado C.R.S. § 8-17.5-101, *et.seq.* (House Bill 06-1343).

2.39. Ethics: The Contractor shall not accept or offer gifts or anything of value nor enter into any business arrangement with any employee, official, or agent of the Owner.

2.40. Failure to Deliver: In the event of failure of the Contractor to deliver services in accordance with the contract terms and conditions, the Owner, after due oral or written notice, may procure the services from other sources and hold the Contractor responsible for any costs resulting in additional purchase and administrative services. This remedy shall be in addition to any other remedies that the Owner may have.

2.41. Failure to Enforce: Failure by the Owner at any time to enforce the provisions of the contract shall not be construed as a waiver of any such provisions. Such failure to enforce shall not affect the validity of the contract or any part thereof or the right of the Owner to enforce any provision at any time in accordance with its terms.

2.42. Force Majeure: The Contractor shall not be held responsible for failure to perform the duties and responsibilities imposed by the contract due to legal strikes, fires, riots, rebellions, and acts of God beyond the control of the Contractor, unless otherwise specified in the contract.

2.43. Independent Contractor: The Contractor shall be legally considered an Independent Contractor and neither the Contractor nor its employees shall, under any circumstances, be considered servants or agents of the Owner. The Owner shall be at no time legally responsible for any negligence or other wrongdoing by the Contractor, its servants, or agents. The Owner shall not withhold from the contract payments to the Contractor any federal or state unemployment taxes, federal or state income taxes, Social Security Tax or any other amounts for benefits to the Contractor. Further, the Owner shall not provide to the Contractor any insurance coverage or other benefits, including Workers' Compensation, normally provided by the Owner for its employees.

2.44. Nonconforming Terms and Conditions: A bid that includes terms and conditions that do not conform to the terms and conditions of this Invitation for Bid is subject to rejection as non-responsive. The Owner reserves the right to permit the Contractor to withdraw nonconforming terms and conditions from its bid prior to a determination by the Owner of non-responsiveness based on the submission of nonconforming terms and conditions.

Items for non-responsiveness may include, but not be limited to:

a. Submission of the Bid on forms other than those supplied by the City;

b. Alteration, interlineation, erasure, or partial detachment of any part of the forms which are supplied herein;

c. Inclusion of unauthorized additions conditional or alternate Bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite, or ambiguous as to its meaning;

d. Failure to acknowledge receipt of any or all issued Addenda;

e. Failure to provide a unit price or a lump sum price, as appropriate, for each pay item listed except in the case of authorized alternative pay items;

f. Failure to list the names of Subcontractors used in the Bid preparation as may be required in the Solicitation Documents;

g. Submission of a Bid that, in the opinion of the Owner, is unbalanced so that each item does not reasonably carry its own proportion of cost or which contains inadequate or unreasonable prices for any item;

h. Tying of the Bid with any other bid or contract; and

i. Failure to calculate Bid prices as described herein.

2.45. Evaluation of Bids and Offers: The Owner reserves the right to:

- reject any and all Bids,
- waive any and all informalities,
- negotiate final terms with the Successful Bidder, and
- disregard any and all nonconforming, nonresponsive or conditional Bids.

Discrepancies between words and figures will be resolved in favor of words. Discrepancies between Unit Prices and Extended Prices will be resolved in favor of the Unit Prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. The corrected extensions and totals will be shown in the tabulation of Bids.

The Owner may consider the qualifications and experience of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the work as to which the identity of Subcontractors and other persons and organizations must be submitted. Operating costs, maintenance considerations performance data, and guarantees of materials and equipment may also be considered by the Owner.

The Owner will conduct such investigations as deemed necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Offeror, proposed Subcontractors and other persons and organizations to do the Work in accordance with the *Contract Documents* to the City's satisfaction within the Contract Time.

The Offeror shall furnish the Owner all information and data requested by the Owner to determine the ability of the Offeror to perform the Work. The Owner reserves the right to reject the Bid if the evidence submitted by, or investigation of such Offeror fails to satisfy the Owner that such Offeror is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

By submitting a Bid, each Offeror authorizes the Owner to perform such investigation of the Offeror as the Owner deems necessary to establish the responsibility, qualifications and financial ability of the Offeror and, by its signature thereon, authorizes the Owner to obtain reference information concerning the Offeror and releases the party providing such information and the Owner from any and all liability to the Offeror as a result of such reference information so provided.

The Owner reserves the right to reject the Bid of any Offeror who does not pass any evaluation to the Owner’s satisfaction.

If the Contract is to be awarded, it will be awarded to the Offeror who, by evaluation, the Owner determines will best meet the Owner's interests.

The Owner reserves the right to accept or reject the Work contained in any of the Price Bid Schedules or alternates, either in whole or in part.

2.46. Award of Contract: Unless otherwise indicated, a single award will be made for all the bid items in an individual bid schedule. In the event that the Work is contained in more than one Bid Schedule, the City may award Schedules individually or in combination. In

the case of two Bid Schedules which are alternative to each other, only one of such alternative Schedules will be awarded. Within forty-five (45) Calendar Days of Bid Opening, the City will issue a Notice of Award to the Successful Bidder which will be accompanied by four (4) unsigned copies of the Contract and the Performance and Payment Bond forms. Within ten (10) Calendar Days thereafter, the Successful Bidder shall sign and deliver four (4) copies of the Contract, Performance Bond, Payment Bond and Certificates of Insurance to the City. Within ten (10) Calendar Days thereafter, the City will deliver two (2) fully executed counterparts of the Contract to the Contractor. No contract shall exist between the Successful Bidder and the City and the Successful Bidder shall have no rights at law or in equity until the Contract has been duly executed by the City.

The Successful Bidder's failure to sign and submit a Contract and other documents set forth in this Paragraph within the prescribed time shall be just cause of annulment of the award, and forfeiture of the Bid Guaranty. The award of Contract may then be made to the next qualified Bidder in the same manner as previously prescribed.

2.47. Ownership: All plans, prints, designs, concepts, etc., shall become the property of the Owner.

2.48. Oral Statements: No oral statement of any person shall modify or otherwise affect the terms, conditions, or specifications stated in this document and/or resulting agreement. All modifications to this request and any agreement must be made in writing by the Owner.

2.49. Patents/Copyrights: The Contractor agrees to protect the Owner from any claims involving infringements of patents and/or copyrights. In no event shall the Owner be liable to the Contractor for any/all suits arising on the grounds of patent(s)/copyright(s) infringement. Patent/copyright infringement shall null and void any agreement resulting from response to this IFB.

2.50. Remedies: The Contractor and Owner agree that both parties have all rights, duties, and remedies available as stated in the Uniform Commercial Code.

2.51. Venue: Any agreement as a result of responding to this IFB shall be deemed to have been made in, and shall be construed and interpreted in accordance with, the laws of the City of Grand Junction, Mesa County, Colorado.

2.52. Expenses: Expenses incurred in preparation, submission and presentation of this IFB are the responsibility of the company and cannot be charged to the Owner.

2.53. Sovereign Immunity: The Owner specifically reserves its right to sovereign immunity pursuant to Colorado State Law as a defense to any action arising in conjunction to this agreement.

2.54. Non-Appropriation of Funds: The contractual obligation of the Owner under this contract is contingent upon the availability of appropriated funds from this fiscal year budget as approved by the City Council or Board of County Commissioners from this fiscal year only. State of Colorado Statutes prohibit obligation of public funds beyond the

fiscal year for which the budget was approved. Anticipated expenditures/obligations beyond the end of the current Owner's fiscal year budget shall be subject to budget approval. Any contract will be subject to and must contain a governmental non-appropriation of funds clause.

2.55. Cooperative Purchasing: Purchases as a result of this solicitation are primarily for the City/County. Other governmental entities may be extended the opportunity to utilize the resultant contract award with the agreement of the successful provider and the participating agencies. All participating entities will be required to abide by the specifications, terms, conditions and pricings established in this Bid. The quantities furnished in this bid document are for only the City/County. It does not include quantities for any other jurisdiction. The City or County will be responsible only for the award for its jurisdiction. Other participating entities will place their own awards on their respective Purchase Orders through their purchasing office or use their purchasing card for purchase/payment as authorized or agreed upon between the provider and the individual entity. The City/County accepts no liability for payment of orders placed by other participating jurisdictions that choose to piggy-back on our solicitation. Orders placed by participating jurisdictions under the terms of this solicitation will indicate their specific delivery and invoicing instructions.

2.56. Keep Jobs in Colorado Act: Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a). If Contractor claims it is entitled to a waiver pursuant to C.R.S. §8-17-101(1), Contractor shall state that there is insufficient Colorado labor to perform the work such that compliance with Article 17 would create an undue burden that would substantially prevent a project from proceeding to completion, and shall include evidence demonstrating the insufficiency and undue burden in its response.

Unless expressly granted a waiver by the Owner pursuant to C.R.S. §8-17-101(1), Contractor shall be responsible for ensuring compliance with Article 17 of Title 8, Colorado Revised Statutes requiring 80% Colorado labor to be employed on public works. Contractor shall, upon reasonable notice provided by the Owner, permit the Owner to inspect documentation of identification and residency required by C.R.S. §8-17-101(2)(a).

2.56.1. "Public project" is defined as:

(a) any construction, alteration, repair, demolition, or improvement of any land, building, structure, facility, road, highway, bridge, or other public improvement suitable for and intended for use in the promotion of the public health, welfare, or safety and any maintenance programs for the upkeep of such projects

(b) for which appropriate or expenditure of moneys may be reasonably expected to be $500,000.00 or more in the aggregate for any fiscal year

(c) except any project that receives federal moneys.

3. Statement of Work

3.1. GENERAL:

The Kannah Creek Intake diverts water to the primary reservoir for the City of Grand Junction. The diversion has been operating since the early 1900's. While updates have been made in the following decades, much of the existing site is past its design life. The intake also has several maintenance challenges including, debris blockage, ice buildup in the winter, and aging facilities. The purpose of this project is to address these maintenance concerns, upgrade equipment to extend service life and enable more automated control and reporting.

3.2. PROJECT DESCRIPTION:

The City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for the rehabilitation of the City of Grand Junction Kannah Creek Intake. All dimensions and scope of work should be verified by Contractors prior to submission of bids. The project generally consists of the installation of 240 LF of 24" Fusible C-905 PVC DR-18 water line, 275' LF of 18" C-905 DR-18 water line, replacement of headgate, installation of a horizontal debris screen, two 6" air valves, two electromagnetic flow meters (one 8" and one 18"), and bypass pipe in 3 locations. Control upgrades include bypass control valves and electronic automation Including one Programmable Logic Controller (PLC), which will be housed in a new prefabricated structure. The new structure must also contain irrigation pump and control and the water treatment equipment that provides potable water to the City's Water Supply Supervisor residence. Potable water service to this residence must be maintained for the duration of the project. All concrete installation shall include 6" of Class 6 aggregate base course.

3.3. SPECIAL CONDITIONS & PROVISIONS:

3.3.1 Mandatory Site Visit Meeting: **Prospective bidders are required to attend a mandatory pre-bid meeting on October 3, 2017 at 10:00am**. Meeting location shall be on site, located at 10001 Kannah Creek Rd, Whitewater, CO 81527. The purpose of this visit will be to inspect and to clarify the contents of this Invitation for Bids (IFB).

3.3.2 QUESTIONS REGARDING SOLICITATION PROCESS/SCOPE OF WORK:

Duane Hoff Jr., Senior Buyer
City of Grand Junction
duaneh@gjcity.org

3.3.2 Project Manager: The Project Manager for the Project is John Eklund, Project Engineer, who can be reached at (970) 244-1558. During Construction, all notices, letters, submittals, and other communications directed to the City shall be addressed and mailed or delivered to:

City of Grand Junction
Department of Public Works
Attn: John Eklund, Project Engineer
333 West Avenue, Building C
Grand Junction, CO 81501

3.3.3 Affirmative Action: The Contractor is not required to submit a written Affirmative Action Program for the Project.

3.3.4 Pricing: Pricing shall be all inclusive to include but not be limited to: all labor, equipment, supplies, materials, freight (F.O.B. Destination – Freight Pre-paid and Allowed to each site), travel, mobilization costs, fuel, set-up and take down costs, and full-time inspection costs, and all other costs related to the successful completion of the project.

The Owner shall not pay nor be liable for any other additional costs including but not limited to: taxes, shipping charges, insurance, interest, penalties, termination payments, attorney fees, liquidated damages, etc.

3.3.5 Freight/Shipping: All freight/shipping shall be F.O.B. Destination – Freight Pre-Paid and Allowed to the project site(s), Grand Junction, CO.

Contractor must meet all federal, state, and local rules, regulations, and requirements for providing such services.

3.3.6 Contract: A binding contract shall consist of: (1) the IFB and any amendments thereto, (2) the bidder's response (bid) to the IFB, (3) clarification of the bid, if any, and (4) the City's Purchasing Department's acceptance of the bid by "Notice of Award" or by "Purchase Order". All Exhibits and Attachments included In the IFB shall be incorporated into the contract by reference.

A. The contract expresses the complete agreement of the parties and, performance shall be governed solely by the specifications and requirements contained therein.

B. Any change to the contract, whether by modification and/or supplementation, must be accomplished by a formal contract amendment signed and approved by and between the duly authorized representative of the bidder and the City Purchasing Division or by a modified Purchase Order prior to the effective date of such modification. The bidder expressly and explicitly understands and agrees that no other method and/or no other document, including acts and oral communications by or from any person, shall be used or construed as an amendment or modification to the contract.

3.3.7 Time of Completion: The scheduled time of Completion for the Project is **75** Calendar Days from the starting date specified in the Notice to Proceed.

Completion is achieved when site cleanup and all punch list items (resulting from the final inspection) have been completed. Completion shall have the meaning set forth in Article I, Section 3 (Definitions and Terms) of the General Contract Conditions.

3.3.8 Working Days and Hours: The working days and hours shall be as stated in the General Contract Conditions or as mutually agreed upon in the preconstruction meeting with the following exception:

All work shall be performed Monday – Friday between the hours of 7:00 AM to 5:00 PM.

3.3.9 Licenses and Permits: Contractor is responsible for obtaining all necessary licenses and permits required for Construction, at Contractors expense. See Section 2.10. Contractor shall supply to Owner all copies of finalized permits.

3.3.10 Permits: The following permits are required for the Project and will be obtained by the City at no cost to the Contractor:

None

The following permits are required for the Project and shall be obtained and paid for by the Contractor, with the costs included in the total bid price for the Project:

- Electrical
- Stormwater/Dewatering

3.3.11 City Furnished Materials: The City will furnish the following materials for the Project:

- FCA Farmers Screen and appurtenances

3.3.12 Project Newsletters: A newsletter for the Project will be prepared and distributed by the City. It will include general information about the Project including interruptions in utility services, street closures, parking restrictions, project schedule, and the names and telephone numbers of the contacts for the City and Contractor. The newsletter will be mailed approximately one week before the Contractor commences work.

The Contractor will be responsible for notifying all businesses and / or residents located adjacent to the work. Door hanger notifications shall be distributed at least two (2) working days prior to the day the work is scheduled to begin.

3.3.13 Project Sign: Project signs, if any, will be furnished and installed by the City.

3.3.14 Authorized Representatives of the City: Those authorized to represent the City shall include Purchasing Agent, Engineers, and Inspectors employed by the City, only.

3.3.15 Stockpiling Materials and Equipment: All stockpiling/storage shall be in accordance with General Contract Condition Section 51.

3.3.16 Traffic Control: The Contractor shall provide and maintain traffic control in accordance with the approved Traffic Control Plan and the Manual on Uniform Traffic Control Devices. A Traffic Control Plan shall be prepared by the Contractor and reviewed by the City **two days prior** to the pre-construction meeting.

3.3.17 Clean-Up: The Contractor is responsible for cleaning up all loose materials that have been deposited or swept into gutters, and onto sidewalks, driveways and streets as a result of operations. The costs for all clean-up work shall be considered incidental and will not be paid for separately.

3.3.18 Quality Control Testing: Supplier shall perform quality control testing on the following items as specified in the General Contract Documents for Capital Improvement Projects as specified for Part time inspection:

- Backfill
- Class 3
- Class 6
- Concrete

The City will perform all other necessary QA/QC.

3.3.19 Schedule of Submittals: Contractor shall deliver these submittals at least two days prior to the pre-construction meeting:

- Traffic Control Plans
- Project Schedule

3.3.20 Uranium Mill Tailings: It is anticipated that radioactive mill tailings will not be encountered on this Project.

3.3.21 Fugitive Petroleum or Other Contamination: It is anticipated that soil contamination from fugitive petroleum or other contaminants will not be encountered with the Project.

3.3.22 Excess Material: All excess materials shall be disposed in accordance with General Contract Condition Section 50.

3.3.23 Existing Utilities and Structures: Utilities were **not** potholed during design of this project. The location of existing utilities and structures shown on the Plans is approximate with the information gathered during design. It is the responsibility of the Contractor to pothole/locate and protect all structures and utilities in accordance with General Contract Condition Section 37.

3.3.24 Interruption of Utilities and Services: The contractor shall notify all property owners affected by the interruption of utilities and other services caused by his operation. Such notice shall be given at least 24 hours prior to the interruption. Notice shall be given for, but not limited to the interruption of domestic water, sanitary sewer, trash pickup, mail delivery and changes in access to the property.

3.3.25 Incidental Items: Any item of work not specifically identified or paid for directly, but which is necessary for the satisfactory completion of any paid items of work, will be considered as incidental to those items, and will be included in the cost of those items.

3.3.26 Survey: The Contractor shall give the City survey crew a minimum of 72 hours' notice for all requested survey.

3.3.27 Work to be Performed by the City (Prior to Construction):

- N/A

3.3.28 Existing Concrete Sidewalks, Pans, Fillets, Curbs and Gutters: The existing sidewalks, pans, fillets, curb and gutter are in good serviceable condition. In most instances the installation of new sidewalk and pavement will be adjacent to existing concrete. The Contractor will need to protect all concrete adjacent to construction. If the concrete is damaged during construction the Contractor will be responsible for its replacement at no cost to the City. The Contractor, the City Project Inspector, and/or the City Project Manager will walk and record any concrete that is deemed to be damaged before construction has started.

3.3.29 ACI Concrete and Flatwork Finisher and Technician: Hand finishing concrete will be permitted only when performed under the direct supervision of a craftsman holding the following certificate: ACI Concrete Flatwork Finisher and Technician (ACICFFT) or other Flatwork Finisher certification program approved by the City Engineering Manager.

3.4. SCOPE OF WORK:

STANDARD SPECIFICATIONS FOR CONSTRUCTION OF UNDERGROUND UTILITIES:

The ***City of Grand Junction Standard and Specifications for Underground Utilities*** are hereby modified or supplemented for this Project with the project specifications in **Appendix B, Project Special Provisions**. The ***City of Grand Junction Standards and Specifications for Road and Bridge Construction*** projects are supplemented by the ***Standard Specifications for Road and Bridge Construction*** State Department of Highways, Division of Highways, State of Colorado where applicable. Additional scope and specifications attached in **Appendix C** Construction Drawings.

3.5. Attachments:

Appendix A: Project Submittal Form
Appendix B: Project Special Provisions
Appendix C: Construction Drawings

3.6. Contractor Bid Documents: For Contractor's convenience, the following is a list of forms/items to be submitted with the Contractor's bid response. However, should a form/item not be listed in this section, but required in the solicitation documents, it is the Contractor's responsibility to ensure all forms/items are submitted.

- Contractor's Bid Form
- Price Bid Schedule
-Sub-Contractor's Form

3.7. IFB TENTATIVE TIME SCHEDULE:

Invitation For Bids available	September 22, 2017
Mandatory Site Visit Meeting	October 3, 2017
Inquiry deadline, no questions after this date	October 6, 2017
Addendum Posted	October 10, 2017
Submittal deadline for proposals	October 16, 2017
City Council Approval	November 1, 2017
Notice of Award & Contract execution	November 2, 2017
Bonding & Insurance Cert due	November 9, 2017

Preconstruction meeting	November 7., 2017
Work begins no later than	November 13, 2017
Final Completion	75 Calendar Days from Notice to Procced
Holidays:	November 23, 2017
	November 24, 2017
	December 25, 2017
	January 1, 2017

4. Contractor's Bid Form

Bid Date: _____

Project: IFB-4414-17-DH "Kannah Creek Intake Rehabilitation"

Bidding Company: _____

Name of Authorized Agent: _____

Email _____

Telephone_____ Address_____

City_____State_____Zip_____

The undersigned Bidder, in compliance with the Invitation for Bids, having examined the Instruction to Bidders, General Contract Conditions, Statement of Work, Specifications, and any and all Addenda thereto, having investigated the location of, and conditions affecting the proposed work, hereby proposes to furnish all labor, materials and supplies, and to perform all work for the Project in accordance with Contract Documents, within the time set forth and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this Contractor's Bid Form is a part.

The undersigned Contractor does hereby declare and stipulate that this offer is made in good faith without collusion or connection to any person(s) providing an offer for the same work, and that it is made in pursuance of, and subject to, all terms and conditions of the Instructions to Bidders, the Specifications, and all other Solicitation Documents, all of which have been examined by the undersigned.

The Contractor also agrees that if awarded the Contract, to provide insurance certificates within ten (10) working days of the date of Notification of Award. Submittal of this offer will be taken by the Owner as a binding covenant that the Contractor will be prepared to complete the project in its entirety.

The Owner reserves the right to make the award on the basis of the offer deemed most favorable, to waive any formalities or technicalities and to reject any or all offers. It is further agreed that this offer may not be withdrawn for a period of sixty (60) calendar days after closing time. Submission of clarifications and revised offers automatically establish a new thirty-day (30) period.

Prices in the bid proposal have not knowingly been disclosed with another provider and will not be prior to award.

- Prices in this bid proposal have been arrived at independently, without consultation, communication or agreement for the purpose of restricting competition.
- No attempt has been made nor will be to induce any other person or firm to submit a bid proposal for the purpose of restricting competition.
- The individual signing this bid proposal certifies they are a legal agent of the offeror, authorized to represent the offeror and is legally responsible for the offer with regard to supporting documentation and prices provided.
- Direct purchases by the City of Grand Junction are tax exempt from Colorado Sales or Use Tax. Tax exempt No. 98-903544. The undersigned certifies that no Federal, State, County or Municipal tax will be added to the above quoted prices.
- Prompt payment discount of _____ percent of the net dollar will be offered to the Owner if the invoice is paid within _____ days after the receipt of the invoice. Payment Terms _____.

RECEIPT OF ADDENDA: the undersigned Contractor acknowledges receipt of Addenda to the Solicitation, Specifications, and other Contract Documents.

State number of Addenda received: _____.

It is the responsibility of the Bidder to ensure all Addenda have been received and acknowledged.

By signing below, the Undersigned agree to comply with all terms and conditions contained herein.

Company: _____

Authorized Signature: _____

Title: _____

Bid Schedule: Kannah Creek Intake Rehabilitation

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
1	108.2	Irrigation Pipe (6") (SDR 35 PVC)	38.5	LF	$ _____	$ _____
2	108.2	Water Main (6") (C900, DR-18)	27.	LF	$ _____	$ _____
3	108.2	Water Main (8") (C900, DR-18)	34.	LF	$ _____	$ _____
4	108.2	Water Main (18") (C-905, DR-18) (Includes all Bell Joint Restraints and Connection to existing pipe)	282.	LF	$ _____	$ _____
5	108.2	Water Main (24") (C-905, DR-18) (Includes all Bell Joint Restraints and Connection to existing pipe and intake inlet)	237.		$ _____	$ _____
6	108.3	Check Valve (6") (Tideflex Checkmate Series 35 or Engineer approved	2.	EA	$ _____	$ _____
7	108.3	Check Valve (8") (Tideflex Checkmate Series 35 or Engineer approved	1.	EA	$ _____	$ _____
8	108.3	Combination Air Valve and Vault Assembly (6") (Includes Bedding material, flanged butterfly valve w/ 90o angle nut, air valve, 60" concrete vault, frost proof ring and cover, galvanized vent pipe, and all necessary fittings to complete	2.	EA	$ _____	$ _____
9	108.3	Elbow (2" x 90 deg)	14.	EA	$ _____	$ _____
10	108.3	Elbow (6" x 22.5 deg)	1.	EA	$ _____	$ _____
11	108.3	Elbow (6" x 90 deg)	2.	EA	$ _____	$ _____
12	108.3	Elbow (8" x 90 deg)	3.	EA	$ _____	$ _____
13	108.3	Elbow (18" x 22.5 deg)	1.	EA	$ _____	$ _____
14	108.3	Elbow (18" x 45 deg)	4.	EA	$ _____	$ _____
15	108.3	Elbow (24" x 11.25 deg)	2.	EA	$ _____	$ _____
16	108.3	Elbow (24" x 22.5 deg)	1.	EA	$ _____	$ _____
17	108.3	Electromagnetic Flow Sensor (8") (Spirax-Sarco MagFlow MAG 5100 W or Engineer approved equal) (Includes fittings to connect to waterline)	1.	EA	$ _____	$ _____
18	108.3	Electromagnetic Flow Sensor (18") (Spirax-Sarco MagFlow MAG 5100 W or Engineer approved equal) (Includes fittings to connect to waterline)	1.	EA	$ _____	$ _____
19	108.3	Gate Valve (6") (Manual)	1.	EA	$ _____	$ _____
20	108.3	Gate Valve (8") (Includes Actuator)	1.	EA	$ _____	$ _____
21	108.3	Slide Gate (24") (Whipps 800 Series or Engineering approved equivalent) (Includes modification of existing concrete structure to accommodate new gate and actuator)	2.	EA	$ _____	$ _____
22	108.3	Tee (18" x 6")	1.	EA	$ _____	$ _____
23	108.3	Tee (18" x 8")	1.	EA	$ _____	$ _____

Bid Schedule: Kannah Creek Intake Rehabilitation

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
24	108.4	Irrigation Connection (2") (Include connection to Irrigation pump, pump starter, well pump VFD)	Lump	Sum	- - -	$ _____
25	108.4	Irrigation Service Line (2") (Sch 40) (Include Elbows and Fittings to complete assembly and connect to Tapping Saddle and service line)	56.	LF	$ _____	$ _____
26	108.4	Water Service Line (2") (Sch 40) (Include Elbows and Fittings to complete assembly and connect to existing well and service line)	53.	LF	$ _____	$ _____
27	108.4	Water Treatment Connection (Includes Water meter, Expansion Tank, Filters, UV Filter, Water Softener, Potable Water System Pressure Transmitter, Conduit, Fittings and Connects) (Water service to house must remain in operation for the duration of the project)	Lump	Sum	- - -	$ _____
28	108.5	Pipe Valve Vault (60" I.D.) (8' Inside Height) (Inverted Ring/Cover) (Includes 6" thick Type A Bedding, adjustable pipe saddles (2) and all necessary fittings to complete	4.	EA	$ _____	$ _____
29	201	Clearing and Grubbing (Includes trees, bushes, and native vegetation)	0.27	AC	$ _____	$ _____
30	202	Abandon Pipe (Abandon pipe by plugging both ends with concrete)	1.	EA	$ _____	$ _____
31	202	Remove Building (Includes removal of concrete spillway and foundation wall to minimum 12" below finished grade)	Lump	Sum	- - -	$ _____
32	202	Remove Existing Air Valve	1.	EA	$ _____	$ _____
33	202	Remove Existing Pipe (Size as shown on plans)	350.	LF	$ _____	$ _____
34	202	Remove Sidewalk	6.44	SY	$ _____	$ _____
35	203	Embankment Fill (Complete-in-Place)	735.	CY	$ _____	$ _____
36	203	Rock Excavation (1 CY and larger)	75.	CY	$ _____	$ _____
37	207	Stripping and Stockpiling Topsoil	90.	CY	$ _____	$ _____
38	207	Topsoil	160.	CY	$ _____	$ _____
39	210	Modify Structure (Remove Steel bars from inlet opening)	Lump	Sum	- - -	$ _____
40	212	Seeding (Native)	0.3	AC	$ _____	$ _____
41	202	Seeding (Lawn)	0.02	AC	$ _____	$ _____
42	216	Soil Retention Blanket (Biodegradable Straw/Coconut)	725.	SY	$ _____	$ _____

Bid Schedule: Kannah Creek Intake Rehabilitation

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
43	304	Aggregate Base Coarse (Class 3) (Place in maximum 12" lifts compacted to 95% Standard Proctor)	70.	CY	$ _____	$ _____
44	506	Riprap Protection (6" D50 CDOT Gradation) Contractor shall use as much riprap from project trench excavation for rock protection where called out on the plans)	13.	CY	$ _____	$ _____
45	608	Concrete Sidewalk (4") (Includes 6" Class 6 Aggregate Base Coarse)	11.	SY	$ _____	$ _____
46	620	Sanitary Facility	Lump	Sum	- - -	$ _____
47	625	Construction Surveying	Lump	Sum	- - -	$ _____
48	626	Mobilization	Lump	Sum	- - -	$ _____
49	SP	Electrical & Control	Lump	Sum	- - -	$ _____
50	SP	FCA Modular Farmers Screen (Installation only)	Lump	Sum	- - -	$ _____
51	SP	Prefabricated Shed (10' x 12' Interior Dimensions) (Refer to Appendix _ for information) (Include 4" concrete foundation on 6" Class 6 Aggregate Base Coarse	Lump	Sum	- - -	$ _____
52		Dewater Inlet	Lump	Sum	- - -	$ _____
MCR		Minor Contract Revisions	- - -	- - -	- - -	$ 30,000.00
				Bid Amount:		**$** _____

Bid Amount:

_____ **dollars**

The undersigned Bidder proposes to subcontract the following portion of Work:

Name & address of Sub-Contractor	Description of work to be performed	% of Contract

The undersigned Bidder acknowledges the right of the City to reject any and all Bids submitted and to waive informalities and irregularities therein in the City's sole discretion.

By submission of the Bid, each Bidder certifies, and in the case of a joint Bid each party thereto certifies as to his own organization, that this Bid has been arrived at independently, without collusion, consultation, communication, or agreement as to any matter relating to this Bid with any other Bidder or with any competitor.

Appendix A

PROJECT SUBMITTAL FORM

Kannah Creek Intake Rehabilitation Project

PROJECT SUBMITTAL FORM

PROJECT: **Kannah Creek Intake Rehabilitation Project**

CONTRACTOR:

PROJECT ENGINEER: John Eklund

Description	Date Received	Resubmittal Requested	Resubmittal Received	Date Accepted
WATERLINE CONSTRUCTION SUBMITTALS				
Pipe – AWWA C-900 PVC, DR-18, AWWA C-905 PVC, DR-18, SDR 35, SCH 40				
Fittings – Elbows, Tees, Tapping Saddles, Coupling,				
Valves, Gate valves, slide gates check valves				
Tracking wire & splices				
Pipe Bedding Gradation (Type A)				
Electromagnetic Flow Sensors				
Combination Air Valve and Vault Assembly (Includes Butterfly Valve)				
Mechanical Joint Restraints and Bell Restraints				
Adjustable Pipe Saddle Support				
60” Concrete Vault				
Concrete Mix Design (3000 psi) Thrust Restraint, Sidewalk, Foundations				
Embankment Fill Gradation, Proctor Curve				
Base Course Gradation, Proctor Curve				

Description	Date Received	Resubmittal Requested	Resubmittal Received	Date Accepted

ELECTRICAL & CONTROL CONSTRUCTION SUBMITTALS

Prefabricated Shed				
Conduit -				
Actuators				
Electrical Components				
Control Components				
Analytical Components				
Heater				
Ancillary Components				
Pull Boxes				

EROSION CONTROL / STORMWATER MANAGEMENT

Concrete Washout				
Riprap Gradation				
Biodegradable Soil Retention Blanket				
Seed Mix – Native and lawn				

PERMITS, PLANS, OTHER

Construction Schedule				
CDPHE Dewatering Permit (if necessary)				

Appendix B

PROJECT SPECIAL PROVISIONS

Kannah Creek Intake Rehabilitation Project

SP-1 SUGGESTED INSTALLATION PROCEDURE OF FCA MODULAR FARMERS SCREEN

FCA representative will be on site to ensure proper installation of modular fish screen. The description below is a suggested method of installation for the modular screen from the FCA Website (farmerscreen.org)

a. For a modular screen installation, plan on 1 to 3 days total construction time.
b. De-water the diversion. Ensure that the head-gate is sealed to provide as dry a construction site as possible. If a head-gate installation is part of the project, then sand bagging and dewatering of the installation point is necessary. Make sure the necessary fisheries biologists have been consulted and have given consent to this procedure.
c. Using a laser level or other method for accurate determination of elevation, excavate screen installation location. Typically, excavation must be deep enough to allow for a minimum of 6" of compacted gravel under the Farmers Screen Modular structure. Local soil conditions and types will dictate required site preparation. If high water table could be an issue, then ensure adequate drainage to eliminate the possibility of the screen structure floating (reduce the upward hydraulic pressure by giving an outlet to water that could accumulate under the screen).
d. Place Farmers Screen Modular sections. Each section weighs between 800 and 1000 pounds, so a machine capable of lifting and placing these components is required. Ensure that the screen structure is at the proper elevation and that it is level in all directions. Bolt together screen sections using supplied hardware. Lay a bead of 100% silicone caulk (provided) along attachment seams prior to attachment.
e. Place the intake flume. Ensure that the intake flume is at the proper elevation and that it is level in all directions. Attach the intake flume with the supplied hardware. Lay a bead of 100% silicone caulk along the attachment seams prior to attachment.
f. Place the fish return flume or plenum. Ensure that the return flume or plenum is at the proper elevation and is level in all directions. Attach the return flume with the supplied hardware. Lay a bead of 100% silicone caulk along the attachment seams prior to attachment.
g. Place fish return pipe or construct fish return channel. The design of the fish return will typically be determined by the local fisheries biologist from the relevant state or federal agency. Typically, the return will be in a pipe and will be set at a slope that provides in pipe velocities that meet National Marine Fisheries Service standards (1.3% slope is a good starting place).
h. If the Farmers Screen Modular system includes a sediment management system, then installation of the pipes and valve outside of the screen structure must occur prior to backfilling around the screen. Install the control valve on the exterior of the screen structure. Install the pipe for returning the sediment to the stream and connect it to the previously installed valve. Ensure that some type of an access box is installed to allow access to the valve.
i. Back fill around all components. Typically, native material is adequate, however, in high water table applications, drain rock might be a good alternative.
j. If the conveyance between the headgate and the entrance flume is open channel, then providing some large rock armoring around the flume entrance is necessary. Using rock to shape an entrance to the flume that is roughly the same width as the

flume will provide better entrance hydraulics and will reduce the chance of erosion around the entrance flume.

k. Open the head gate and test the screen through the expected range of flows. A flow measuring device such as a velocimeter is necessary to accurately determine actual flow. Ensure that the screen is operating properly and that the by-pass system is operating as expected.

SP-2 PREFABRICATED BUILDING

Prefabricated shed shall consist of the following

- Interior dimensions: 10’ x 12’
- 4” Concrete foundation including 6” minimum Class 6 Aggregate Base
- Course (all
- 2” x 4” studs 16” o.c.
- 7’-0” minimum interior wall height
- 4/12 Pitch gable roof
- OSB under Metal siding
- 7/16” OSB roof
- Metal roof w/ ridge vent
- 2 – 2’ x 3’ Single Hung Vinyl Windows
- Insulate Ceiling (R-19)
- Insulate walls (R-11)
- OSB interior walls and ceiling
- 36” x 80” 6-panel O/S exterior door (Includes knob and deadbolt lock)
- Any and all bolts, tie downs or other equipment to secure shed to foundation

Information covering all equipment and material that is to be used on this project shall be submitted. Each sheet of descriptive literature shall be clearly marked to identify material or equipment for which it pertains.

Payment will be made under:

Ref.	Pay Item	Pay Unit
SP	Prefabricated Shed	Lump sum

SP-3 SECTION 108.4 RESIDENTIAL WATER TREATMENT

Section 104 of the Standard Specifications is hereby revised for this project as follows:

Water Treatment Connection shall include equipment and installation of all treatment equipment including but not limited to isolation valves, water meter, line pressure gage, expansion tank, granular filters, UV Filter, Potable Water System Pressure Transmitter and pipe elbows and fittings to connect equipment and provide operable service. Residential Water treatment equipment shall be replaced in-kind and provide equal capacity and equal or better treatment. Installation and connection of all water treatment equipment must conform to manufacturer direction and specifications.

Owner may consider the use of existing equipment in new treatment building. Contractor must provide written plan and schedule for reconnection of existing equipment that explains how connection process and how service disruption time will be minimized. Any equipment reused must be in excellent working condition.

Water service to residence must be maintained for the duration of the project. Contractor must provide written notice 48 hours prior to any disruption of water service to residence.

Information covering all equipment and material that is to be used on this project shall be submitted. Each sheet of descriptive literature shall be clearly marked to identify material or equipment for which it pertains.

Section 108.4 of the Standard Specifications is hereby revised for this project as follows:

Payment will be made under:

Ref.	Pay Item	Pay Unit
108.4	Water Treatment	Lump Sum

SP-4 SECTION 103 – REMOVALS, EXCAVATION, BACKFILLING AND RESTORATION

Section 103 of the Standard Specifications is hereby revised for this project as follows:

Subsection 103.11, Rock Excavation, shall include the following:

The Contractor can expect during trenching operations that rocks/boulders 1 cubic yard and larger may be encountered and must be removed from the trench. Rocks excavated from the pipeline trench 1 cubic yard and larger will be paid for with the Rock Excavation pay item. All other rock removal that is smaller than 1 cubic yard will not be paid for separately but shall in included in the cost of the pipe installation.

During trench backfilling operations, the Contractor shall not use any rock that is larger than 12" in its largest dimension for backfill material within 1-foot of the new flow line pipe.

Rocks larger than 15" in its largest dimension shall be screened from the excavated material and set aside so it's not used in the trench backfill material.

The 15" and larger rock encountered during trench excavations on private property, the Contractor shall screen the 15" and larger rock and remove the large rock from the private property. The Contractor has the option to haul the large rock to their own secured site to stockpile, or the Contractor can haul the large rock to City property nearby for disposal. If the Contractor hauls the rock to and stockpiles the rock on City property, then the rock shall become the property of the City. The cost for screening, loading, hauling and unloading the 15" and larger rock will not be paid for separately, but shall be included in the cost of the Project.

The 15" and larger rock encountered during trench excavations on City property; the Contractor has the option to set the large rock aside and leave it in place on City property, or the Contractor can haul the rock to a secured site of their own to stockpile. The cost for screening, loading, hauling and unloading the 15" and larger rock at a Contractor secured site will not be paid for by the City, but shall be at the Contractor's expense.

SP-5 SECTION 202 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS

Section 202 of the Standard Specifications is hereby revised for this project as follows:

Subsection 202.07, add the following:

> All concrete removal required for installation of new will be measured and paid for separately.

Subsection 202.12, add the following:

> Locations of saw cuts shall be determined and directed by the Construction Inspector or the Engineer and shall be considered incidental to the work. When removing concrete adjacent to existing asphalt the Contractor shall saw cut at the interface at full depth of concrete (6" minimum) as to not damage asphalt during concrete removal. Any damage to the existing asphalt shall be patched back by the contractor at no cost to the City. All patch work shall be at a minimum of 2' wide and 10' in length (4" Thick).

SP-6 SECTION 203 – EMBANKMENT MATERIAL

Section 203 of the Standard Specifications is hereby revised for this project as follows:

Subsection 203.03 Soil Embankment:
Embankment material shall consist of approved material acquired from excavations or borrow pits and hauled and placed in embankments. Approval of embankment material is contingent on the material meeting the Atterberg Limit and gradation requirements specified in the Contract. Approval of the embankment material in the upper 2 feet of embankment below the subgrade elevation is contingent on the material meeting one of the following as specified in the Contract:

(1) The specified resistance value when tested by the Hveem Stabilometer or the equivalent resilient modulus.
(2) The specified Atterberg Limit and gradation requirements.
(3) The specified resistance value when tested by the Hveem Stabilometer or equivalent resilient modulus, and the specified Atterberg Limit and gradation requirements.

Embankment material shall be classified into one of the material groups listed below, and placed and compacted in accordance with the appropriate methods specified in subsection 203.07. If any material does not meet the criteria for one of the following classifications, it shall be processed on site to meet the requirements for one of the material groups listed below, or disposed of at the Contractor's expense.

(1) Soil Embankment: Soil embankment shall have all particle sizes less than **4 inches**. The material shall be classified in accordance with AASHTO M 145 and placed and compacted in accordance with subsection 203.07(a).

SP-7 SECTION 208 – EROSION CONTROL

For inlet protection along Major Arterial or Collector Street sections the only approved inlet protections shall be a filter sock.

Add the following to this subsection:

208.05(n) Add the Following:

Concrete Washout Structure:
Water for clean-up of equipment used in the mixing or distribution of concrete shall not be discharged to any storm water facilities, drain ways, or deposited into any open fields. The waste water used shall either be wasted on an open excavation area on in an onsite detention facility for future disposal.

Subsection 208.08 Payment for Best Management Practices.

The disposal of wash water shall be considered incidental to the concrete and will not be measured for or paid for separately.

Add the following to this subsection:

Pay Item	**Pay Unit**
Erosion Control (Complete in Place)	Lump Sum

The lump sum price for Erosion Control (complete in place) shall be in full compensation for the Erosion Control Supervisor and all materials, labor and equipment required to furnish, install, maintain, remove and dispose of erosion and settlement control features and Best Management Practices (BMP's) in accordance with the Storm Water Management Plan (SWMP), State and local permits, and the contract documents.

Erosion Control (Complete in Place) shall include storm drain inlet protection and the concrete washout structure.

SP-8 SECTION 212 – SEEDING, FERTILIZER, SOIL CONDITIONER, AND SODDING

Section 212.06 of the Standard Specifications is hereby revised for this project as follows:

Provide the following live seed mixtures to be used in disturbed areas:

Common Name	**Botanical Name**	**% of Mix By Qty.**
Galleta Grass	Hilaria James II	20%
Hard Fescue	Festuca Ovina 'Durar'	20%
Indian Ricegrass	Orizopsis Hymendoides 'Paloma'	12%
Needle & Thread Grass	Stipa Comata	1%
Sheep Fescue	Festuca Ovina 'Covar'	8%
Western Wheatgrass	Agropyron Smith II 'Arriba'	30%
Sand Dropseed	Sporobolus Cryptandrus	1%
Blue Gramma	Bouteloua Gracilis	5%
Side Oats Gramma	Bouteloua Curtipendula	3%
Seed at 5 lb/acre PLS		

Section 212.07 of the Standard Specifications is hereby revised for this project as follows:

Soil Conditioning will be incidental to the seeding (Lawn and/or Native).

SP-9 SECTION 601 – STRUCTURAL CONCRETE

Section 601 of the Standard Specifications is hereby revised for this project as follows:

Subsection 601.02, Classification:

CONCRETE SHALL MEET THE FOLLOWING REQUIREMENTS:

- 4,500 PSI Compressive at 28 Days
- 6% air ±1.5%
- Slump 4", Loads exceeding 4 ½" shall be rejected
- Maximum Water Cement Ratio no greater than 0.45.

Subsection 601.06, Batching:

This CDOT Specification has been added to this Project:

The Contractor shall furnish a batch ticket (delivery ticket) with each load for all concrete. Concrete delivered without a batch ticket containing complete information as specified shall be rejected. The Contractor shall collect and complete the batch ticket at the placement site and deliver all batch tickets to the Engineer or his representative at the end of each day. The Engineer or his representative shall have access to the batch tickets at any time during the placement. The following information shall be provided on each ticket:

1. Suppliers name and date
2. Truck number
3. Project name and location
4. Concrete class and designation number
5. Cubic yards batched
6. Type brand and amount of each admixture
7. Type, brand, and amount of cement and fly ash
8. Weights of fine and course aggregates
9. Moisture of fine and course aggregates
10. Gallons of batch water

The contractor shall add the following information to the batch ticket at time of placement:

1. Gallons of water added by the truck operator.
2. Number of revolutions of the drum for mixing
3. Discharge time

SP-10 SECTION 608 – CURBS, GUTTERS, SIDEWALKS, AND TRAILS

Section 608 of the Standard Specifications is hereby revised for this project as follows:

Subsections 608.06, Basis of Payment shall include the following:

> The Contract Unit Price for the various concrete items shall be full compensation for all equipment, labor, materials, and incidentals required for the complete installation. Incidental items include subgrade compaction, cutting and removal of asphalt in areas where concrete will be installed; disposal of excavated and removed materials; furnishing, placement and compaction of Aggregate Base Course; forming, furnishing and placement, finishing, curing and protection of the concrete; reinforcing steel and joint filler.

SP-11 SECTION 16050 BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes basic electrical requirements for materials and methods applicable to electrical equipment specified under this section and other related sections.
   1. Conduit
   2. Boxes
   3. Wire and Cable
   4. Wiring Devices and Device Plates
   5. Maintenance Materials
   6. Grounding Materials
   7. Luminaries
   8. Power Panels

B. Related Sections:
   1. Section 01340 – Shop Drawings and Product Data
   2. Section 01500 – Construction Facilities and Temporary Controls
   3. Section 01600 – Materials and Equipment
   4. Section 01730 – Operation & Maintenance Data
   5. Section 02300 – Earthwork
   6. Section 09900 – Coatings

1.2 REFERENCES

A. UL – All applicable standards

B. IEEE – All applicable standards

C. IPCEA – All applicable standards

D. NEMA – All applicable standards

E. ANSI/NFPA 70 – National Electrical Code

F. ANSI C2 – National Electrical Safety Code

G. ANSI/NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies

H. ANSI/NEMA OS 1 – Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports

I. ANSI/NEMA OS 2 – Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

J. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)

1.3 SUBMITTALS

A. Information covering all material that is to be used on this project shall be submitted.

B. Each sheet of descriptive literature shall be clearly marked to identify the material or equipment for which it pertains.

C. Equipment on submitted sheets that is not for this project shall be crossed out.

D. As a minimum the following information shall be submitted:
   1. Lamp fixture descriptive sheets identified by the fixture schedule letter
   2. Equipment sheets shall identify what the equipment refers to by calling out the name of the equipment on the sheet.
   3. Schematics and connection diagrams for all electrical equipment shall be submitted.
   4. Submit all types of conduit and cables with manufacturer and sizes as well as all appurtenances.

1.4 QUALITY ASSURANCE

A. Supplier's qualifications
   1. The entire system shall be designed, coordinated, and supplied by a qualified Electrical Contractor who is regularly engaged in the business of building electrical systems for water and wastewater projects. The Electrical Contractor shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.

B. Coordination
   1. The electrical equipment shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment.
   2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
   3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.
   4. All service entrance work shall be in accordance with the local utility standards.
   5. The electrical contractor shall coordinate all service entrance work with the local utility.
   6. The electrical contractor shall NOT pay for the utility's work. That shall be billed directly to the owner.
   7. Accurately record actual locations of conduit, duct banks, panels, and accessories.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable Building Code.

B. Electrical: Conform to latest version of NFPA 70.

C. Coordinate, obtain and pay for all permits, inspections and approvals of authority having jurisdiction.

D. Comply with local electrical codes in force or in the absence of local electrical code, the latest edition of the National Electrical Code, ANSI C1.

1.6 WARRANTY

A. The electrical contractor shall warrant the supplied equipment and labor for a period of one year from the date of system acceptance.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The work for this project is at a functioning municipal water diversion facility and private residence. All new work shall be done in a way that allows the existing facilities to maintain its operation.

B. All equipment furnished under this Section shall be selected by the Contractor for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged, and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
   1. Conduit
      a. Minimum Size: ¾ inch unless otherwise specified, or ½ inch for luminaries pendants.
      b. Underground Installations:
         i) Over 100V: More than five feet from foundation wall: Use thick wall nonmetallic conduit.
         ii) Within five feet from foundation wall: Use rigid steel conduit
         iii) Under 100V: Use rigid steel conduit
         iv) Minimum size: 1 inch.
      c. Outdoor Locations, Above Grade: Use PVC-Coated rigid steel conduit.
         i) This shall include all conduits in the UV area.
      d. In chemical rooms: Use PVC-Coated rigid steel conduit.
      e. In Slab Above Grade:
         i) Use rigid steel conduit for circuits that are 24V or less.
         ii) Use rigid thick wall non-metallic conduit for 120V to 480V circuits.
         iii) Maximum Size Conduit in Slab: 2 inch, 1 inch for conduits that cross over each other, or with structural engineer's approval.
         iv) Conduits shall not be spaced closer than 3 conduit widths on center.
         v) Aluminum conduit shall not be embedded in concrete.
         vi) Conduits shall not pass through a structural concrete beam without the structural engineer's approval.
      f. In or under slab on grade:
         i) Use rigid steel conduit for circuits that are 24V or less.
         ii) Use rigid thick wall non-metallic conduit.
      g. Wet and damp locations: Use rigid steel conduit or aluminum conduit.
      h. Dry locations:
         i) Concealed: In walls or above ceilings, use rigid steel or aluminum conduit.
         ii) Exposed: Use rigid steel conduit or aluminum conduit.

i. Rigid Steel Conduit.
    i) Rigid steel conduit shall be heavy wall, hot-dipped galvanized, and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
j. Rigid Nonmetallic Conduit (PVC).
    i) PVC conduit shall be heavy wall, schedule 40, shall be UL labeled for aboveground and underground uses.
k. PVC-Coated Rigid Steel Conduit.
    i) The conduit shall be rigid steel and before the PVC coating is applied, the hot-dipped galvanized surfaces shall be coated with a primer to ensure a bond between the steel substrate and the coating. The PVC coating shall be bonded to the primed outer surface of the conduit at a thickness of at least 40 mils. A two part urethane chemically cured coating shall be applied at a nominal 2 mil thickness to the interior of all conduit and fittings.
    ii) Manufacturers: Ocal, PermaCote, or Robroy Industries.
l. Rigid Aluminum Conduit.
    i) Rigid aluminum conduit shall be heavy wall and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
m. Flexible connections
    i) Conduit: Moisture proof vinyl jacketed, liquid-tight, hot-dipped galvanized flexible steel and shall be UL labeled.
    ii) Connectors: Watertight, Appleton Type ST or STB, Crouse-Hinds Type LT or LTC, or equal.

2. Outlet Boxes
    a. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, Galvanized.
        i) Luminaries and equipment supporting boxes: rated for weight of equipment supported.
        ii) Concealed installations.
    b. Nonmetallic outlet boxes: ANSI/NEMA OS 2.
    c. Cast Boxes: NEMA FB 1, Type FD, Cast Ferroalloy.
        i) Provide gasketed cover by box manufacturer.
        ii) Provide threaded hubs.
        iii) Models VXF, GRFX as manufactured by Crouse-Hinds.
        iv) Models SEH, JBDX, with mounting lugs as manufactured by Appleton.

3. Pull and Junction
    a. Sheet Metal Boxes: NEMA OS 1, Galvanized Steel.
    b. Surface-Mounted Cast Metal Box: NEMA 250, Type 4 flat-flanged, surface-mounted junction box.
        i) Material: Galvanized cast iron Cast aluminum in corrosive areas.
        ii) Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
        iii) Model: WCB as manufactured by Crouse-Hinds.
    c. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting.
        i) Material: Galvanized cast iron.
        ii) Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
        iii) Cover Legend: ELECTRIC.
        iv) Model: WPD as manufactured by Crouse-Hinds.

4. Large Junction Boxes and Wiring Gutters
    a. Indoor Locations:
        i) Steel, NEMA 12.
    b. Outdoors:
        i) Stainless steel.
        ii) Weather-tight NEMA 4.
    c. Construction.
        i) Provide rigid handles for box covers larger than 9 sq. ft. or heavier than 25 lbs.
        ii) Provide split covers for covers larger than 12 sq. ft.
        iii) Aluminum boxes in concrete not allowed.
5. Seal Fittings
    a. Model ESU with Apelco sealing cement and fiber, as manufactured by Appleton.
    b. Model EZS with Chico X Fiber and Chico A compound as manufactured by Crouse-Hinds.
6. Deflection Fittings
    a. Locations:
        i) Underground conduit runs.
        ii) Runs between concrete sections subject to relative movement.
    b. Material:
        i) Ferroalloy hubs.
        ii) Neoprene outer jacket.
        iii) Stainless steel jacket clamps.
        iv) Molded plastic inner sleeve.
        v) Tinned copper braid grounding strap.
    c. Model XD as Manufactured by Crouse-Hinds.
7. Expansion Fittings
    a. Locations:
        i) In long conduit runs, to permit linear movement caused by thermal expansion and contraction.
        ii) In long conduit runs to prevent conduit from buckling.
        iii) Indoors and outdoors, where conduit expansion occurs or where there is a wide temperature range.
        iv) At structural expansion joints.
    b. Material:
        i) End fittings: Ferroalloy.
        ii) Body: Steel conduit.
    c. Provide Bonding Strap When Used Outdoors.
    d. Model XJ, as Manufactured by Appleton and Crouse-Hinds.
8. Flexible Sealing Compound
    a. “Duxseal” as Manufactured by Johns-Manville.
    b. “Permagum” as Manufactured by In mount.
9. Coal Tar Epoxy Paint
10. Wire and Cable
    a. 600 Volt Power Cable
        i) General Use:
            a) Conductors: Single, copper, 12 AWG minimum.
            b) All conductors shall be stranded.
            c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
            d) Suitability: Wet or dry locations at 75° C and 90° C copper temperature.

e) Or as specified for service entrances.

ii) Service entrance and 4 AWG and above:
   a) Conductors: Single, stranded, copper.
   b) Insulation: 600V cross-linked polyethylene, UL Type XHHW/USE or THHN.
   c) Suitability: Wet or dry locations at 75°C and 90° C copper temperature.

iii) Terminations
   a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap standard cable around screw type terminals

b. Lighting Circuits
   i) General Use:
      a) Conductors: Single, copper, 12 AWG minimum.
      b) Conductors may be solid or stranded.
      c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
      d) Suitability: Wet or dry locations at 75° C and 90° C copper temperature.
   ii) Terminations:
      a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap stranded cable around screw type terminals.

c. Control circuits
   i) General Use:
      a) Conductors: Single, tinned copper, 14 AWG
      b) All conductors shall be stranded
      c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
   ii) Millivolt or Milliampere Instrumentation and Control.
      a) Conductors: 18 AWG stranded copper, 2 or 3 as required.
      b) Insulation: 15 mils, minimum, 90°C PVC.
      c) Shield: Mylar aluminum tape with 20 AWG copper drain wire, fully covering conductors.
      d) Jacket: 20 mils, minimum, 80°C PVC.
      e) Suitability: Wet or dry steel conduit.
   iii) Manufacturers: Belden "UL Instrumentation Cable – 1032A", Samuel Moore "Dekoron ICMX" No. 1852-686 and 1862-686, or equal.

d. Telephone and Networking
   i) Cable.
      a) The cables shall be rated for use in communications circuits.
      b) The cables shall be rated for riser applications.
      c) The cables shall be rated for 75 degrees Celsius applications.
      d) The cables shall be free of defects and splices.
      e) The cables shall be rated for outdoor applications.
      f) The cables shall be rated for P-MSHA applications.
      g) The cables shall pass a -40 degree Celsius cold bend test per UL 1581.
      h) The cables must be UL third party verified to ANSI/TIA/EIA-586-B.2 Category 5e.
      i) The cable shall be ROHS compliant.
      j) The cable shall be CE compliant.
      k) Conductors
         1) The conductors shall be solid, bare copper per ASTM B-3.
         2) The conductors shall be #24 AWG (.20 sq mm).
      l) Insulation

1) The insulation shall be polyolefin.
2) The insulation shall be free of defects and splices.

m) Pairs
1) The cable shall contain four pairs.
2) The insulated conductors shall be bonded together down the entire length of the pair.
3) The pairs shall be marked with a permanent, extruded stripe identification of tip and ring insulated conductors.
4) Each pair shall have a unique twist length to minimize pair to pair coupling.

n) Shielding
1) Shielding shall be an aluminized foil with the foil facing inward, where required.
2) Unshielded cables shall be acceptable except where shielding is required for the system.

o) Jacket.
1) All cables shall have a continuous jacket of Polyvinyl Chloride (PVC).
2) Jacket thickness: The jackets shall be .030" (.75 mm) nominal thickness.
3) The jackets shall be ultraviolet (UV) radiation and sunlight resistant per UL 1581.
4) The jackets shall be oil resistant per UL 1581 Class 43.

p) Manufacturer: Belden "Industrial Data Solutions – 7923A" or equal.

ii) Arc-Proofing Tape: Irvingon "77 Arc-Proofing Tape", Slipknot No. 50 or Slipknot No. 3, or approved equal.

e. Fiber-Optic Cabling System

i) The optical fiber cabling system should use matched components from a single manufacturer, and the cabling system should be certified to deliver system performance over the lifetime of the applications for which the cabling system was originally designed to support.

ii) The optical fiber cabling system should comply with the following standards:
a) ANSI/TIA-EIA-568-C.0
b) ANSI/TIA-EIA-568-C.1
c) ANSI/TIA-EIA-568-C.3

iii) All cables and termination hardware should be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C.0, C.1 and C.3. All fibers of every installed cable should be verified prior to system acceptance. Any defect in the cabling system installation including, but not limited to, cable, patch panels, and connectors should be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

iv) Cable
a) The optical fiber cable should be designed for outdoor applications such as lashed aerial or underground conduit installations as well as for indoor applications.
b) The optical fiber cable should have a waterblocking tape to protect from water migration.
c) The optical fiber cable should be fully dielectric, with no metallic elements in the cable.

d) The optical fiber cable should have fiber tubes that are color coded for easy identification.
e) The optical fiber cable shall have an indoor and outdoor operating temperature of -40°C to +70°C.
f) The optical fiber cable should be UL/cUL rated type OFNR/OFN FT4 as per the flame resistance standard UL 1666 and a Low Smoke Zero Halogen (LSZH) versions.
g) The length of the optical fiber cable shall be determined on site by the contractor.
h) The optical fiber cable shall be Multimode OM-1, 62.5 µm, 12 fibers, indoor/outdoor, as manufactured by Belden or approved equal.

v) Brilliance Fiber Optic Connectors
a) Brilliance Optical Fiber Field Installable Connectors shall provide rapid mechanism for the field-connectorization of multimode 62.5/125-micron, fiber horizontal cabling with SC connectors, and a connection point for optical fiber cord assemblies linking to Work Area station equipment.
1) The optical fiber field-installable connector shall be available in SC format, for installation onto either multimode 62.5/125-micron fiber.
2) The optical fiber field-installable connector shall be field installable, without requiring epoxy or polishing.
3) The optical fiber field-installable connector shall be compatible with 900-micron buffered fibers and 250-micron loose-tube fibers with breakout/fanout kit.
4) The optical fiber field-installable connector shall have a minimum Reflectance of -35 dB for multimode and -55 dB for single mode.
5) The optical fiber field-installable connector shall have a tensile strength of 1.2 lb. (0.5 kg).
6) The optical fiber field-installable connector shall have a durability rating of less than 0.2 dB for multimode and 0.3dB for single mode change after 500 cycles.
7) The optical fiber field-installable connector shall be capable of re-termination up to 5 times with no performance degradation.
8) The optical fiber field-installable connector shall be capable of re-termination up to 5 times without additional parts or tooling in order to un-terminate the connector.
9) The optical fiber field-installable connector shall be part number AX104244-S1 as manufactured by Belden, or approved equal.

11. Wiring Devices
a. General:
i) Industrial Specification grade.
ii) White.
b. Receptacles:
i) 120 V duplex outlets: NEMA 5-20R, 3 wire, grounding, 20A, 125 V, Leviton 5362, or approved equal.
ii) 120 V duplex GFCI outlets: NEMA 5-20R, 3 wire, grounding, 20A, 125 V, Leviton 7899, or approved equal.
iii) 240 V duplex outlets: NEMA 6-20R, 3 wire, grounding, 20A, 250 V, Leviton 5462, or approved equal.

iv) Welding outlets: 50A, 125/250V, 3 pole, 4 wire, grounding, NEMA 14-50R, Leviton 55050, or approved equal.

c. Light Switches:
   i) 277 V lighting circuits: 20 amp, 120/277 V, Leviton 1221-2W to 1224-2W, or approved equal.

12. Device Plates
   a. General:
      i) Mounting hardware countersunk and finished to match plate.
      ii) Provide over-sized plates where standard plates do not cover wall opening.
      iii) Provide engraving as indicated on drawings.
   b. Indoors:
      i) Surface mounted devices: Galvanized or cadmium-plated steel.
      ii) Flush mounted devices in other finished areas: Phenolic plastic, white.
      iii) All other flush mounted devices: Type 302 stainless steel.
   c. Outdoors and Indoors when identified on Drawings as Weatherproof:
      i) Weatherproof with spring doors for receptacles and with provisions for padlocking switches on and off.
      ii) Provide an adaptor plate for flush mounted device plates, Crouse-Hinds FS031, or equal.
13. Grounding and Bonding
   a. Provide rod electrodes, exothermic connections and mechanical connections.
   b. Building perimeter ground cable shall be minimum of 4/0 AWG bare copper.
   c. Duct bank ground cable shall be minimum of 4/0 AWG bare copper.
   d. Other ground cable shall be as noted on the drawings.
14. Luminaries
   a. Furnish products as specified on drawings.
   b. Install ballasts, lamps, and specified accessories at factory.
   c. Accessories:
      i) Provide swivel-type box covers.
      ii) Provide threaded conduit pendants.
   d. Provide all lamps and required mounting hardware.
15. Power Panels
   a. General:
      i) Circuit breaker panel board.
      ii) With neutral.
      iii) Dead front.
   b. Enclosure:
      i) NEMA 12, surface in unfinished areas, NEMA 1 flush in finished areas or as indicated on the drawings.
      ii) Door with latch and lock.
      iii) Typewritten circuit directory.
      iv) Ground stud bolt through cabinet with removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground conductor.
   c. Circuit Breakers:
      i) Molded case thermal magnetic.
      ii) Multiple pole breakers shall be common trip.
      iii) Bolt-in.
      iv) Individually front replaceable.
      v) Indicating “On”, “Off”, and “Tripped”.

vi) RMS symmetrical interrupting capacity shall be as indicated on the drawings.
vii) Breakers, trip ratings, and number of poles as indicated on the drawings.

d. Buses:
   i) Three phase and neutral bus insulated from cabinet.
   ii) Ground bus.
      a) Connected to cabinet.
      b) Clamp type lug for supply circuit and each load circuit.
      c) Removable bond to neutral bus.
   iii) Copper bussing.
   iv) Ampere and voltage ratings as indicated on the drawings.
   v) Bracing coordinated with circuit breakers interrupting capacity.

16. Lighting Panels
   a. General:
      i) Circuit breaker panel board.
      ii) With neutral.
      iii) Dead front.
   b. Enclosure:
      i) NEMA 1 or as indicated on the drawings.
      ii) Door with latch and lock.
      iii) Typewritten circuit directory.
      iv) Ground stud bolt through cabinet with removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground conductor.
   c. Circuit Breakers:
      i) Molded case thermal magnetic.
      ii) Multiple pole breakers shall be common trip.
      iii) Bolt-in or plug-in.
      iv) Individually front replaceable.
      v) Indicating “On”, “Off”, and “Tripped”.
      vi) 10,000 amp RMS symmetrical interrupting capacity at 240 V.
      vii) Handle clips to prevent casual operation for circuit breakers indicated on drawings.
      viii) Ground fault interrupting breakers with a sensitivity of 5mA for receptacle branch circuit and where indicated on drawings.
      ix) Breakers, trip ratings, and number of poles as indicated on the drawings.
   d. Buses:
      i) Two phase and neutral bus insulated from cabinet.
      ii) Ground bus.
         a) Connected to cabinet.
         b) Clamp type lug for supply circuit and each load circuit.
         c) Removable bond to neutral bus.
      iii) Copper.
      iv) Ampere and voltage ratings as indicated on the drawings.
      v) Bracing coordinated with circuit breakers interrupting capacity.

17. Dry-Type Specialty Transformers.
   a. Phase, voltage current ratings as indicated on drawings.
   b. Two 2½% full capacity taps below normal voltage.
   c. Dry type, wall floor or MCC mounted as indicated on the drawings, enclosed for wiring in conduit.
   d. Self air-cooled.

e. Suitable for indoor NEMA 4.
f. Insulation system and average winding temperature rise for rated KVA as follows:
    i) 1-15 KVA: Class 185 with 115°C rise.
    ii) 16-500 KVA: Class 220 with 115°C rise.
g. Sound Levels: NEMA ST20.
h. Ground core and coil assembly to enclose by means of a visible flexible copper grounding strap.
i. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise

18. Control Stations.
    a. Enclosures:
        i) Indoors: NEMA 4X.
        ii) Outdoors: NEMA 4X
    b. Pilot Devices:
        i) Refer to specification section 16900.
    c. Nameplates:
        i) Pilot devices: Laminated plastic nameplates, white surface with a black core, engraved to identify controlled motor or equipment.
        ii) Control station: Laminated plastic nameplates, white surface with a black core, engraved to identify controlled motor or equipment.
19. Equipment Disconnects
    a. General:
        i) Heavy-duty safety switches.
        ii) Square D or Cutler-Hammer.
    b. Enclosure:
        i) Indoor dry areas: NEMA 12.
        ii) Outdoor: NEMA 4X.
        iii) Corrosive Areas: NEMA 4X.
        iv) Use above guidelines unless otherwise noted on drawings.
        v) Padlocked external operating handle.

    c. Switch:
        i) 25,000 amp symmetrical withstand.
        ii) Poles to match equipment served.
        iii) 600 VAC.
        iv) Continuous current rating not less than the serving branch circuit over current protection.
        v) Non-fusible except where fusing is required by the served equipment or as noted on the drawings.
20. Surge Protective Device (SPD).
    a. General:
        i) SPD units shall be installed as shown on the drawings.
        ii) SPD units shall be appropriate for the voltages indicated on the drawings.
        iii) Approved manufacturers: Cutler Hammer, Square D, LEA, or equal.
        iv) SPD units shall comply with UL 1449 and 1283.
        v) SPD units shall comply with IEEE C62.41 and IEEE C62.45.
        vi) SPD units shall have a 30 amp disconnect directly before the TVSS unit.
        vii) SPD units shall have indication for trouble alarms and surge count.

viii) For assembled equipment, the SPD unit shall be of the same manufacturer as the assembled equipment.

b. Ratings:

i) Maximum let through voltage shall be:

Mode	120/208	277/480
L-N or L-G	400V	800V
L-L	800V	1800V

ii) Minimum total surge current capability:

Location	Per Phase	Per Mode
Switchgear	250 KA	125KA
MCC	160KA	80KA
Panelboards	120KA	60KA

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General Requirements

1. The instrumentation equipment shall be installed by the Contractor or his subcontractors in accordance with the manufacturers' instructions. The services of the system supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation.

B. Inspection

1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
   a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

C. Equipment Installation

1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
   a. Separate sheet metal junction boxes, equipment enclosures, sheet metal raceways, etc., mounted on water or earth-bearing walls or wall-mounted outdoors ¼" from wall be corrosion resistant spacer.
   b. Seal the base of all outdoor switchgear, motor control center, and similar equipment with grout.
   c. Screen or seal with flexible sealing compound all openings into outdoor equipment to prevent the entrance of rodents, wasps, and mud-daubers.
   d. Electrical work shall conform to the construction schedule and progress of other trades.
   e. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
   f. Perform all work in accordance with manufacturer's instructions.
      i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.

ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.

g. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.

D. Identification:

1. Conduit. All conduits shall be provided with identification tags. Tags shall be brass nameplates with 3/8" high lettering and attached to the conduits by means of stainless steel wire. Conduits shall be identified at both ends with the same identification number.
2. Cable. Except for lighting and receptacle circuits, each individual wire in power, control, indication, and instrumentation circuits shall be provided with identification markers at the point of termination. Power wires without individualized identification numbers shall be color coded with electrical tape or colored wire jacket. The wire markers shall be of the heat-shrinkable tube type.
3. Control Stations. Control stations shall be provided with nameplates identifying the related equipment. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the drawings. Nameplates shall be laminated plastic, with 1/8 inch engraved letters, and shall be securely fastened to the control stations.
4. Circuit Breakers. Circuit breakers shall be provided with nameplates identifying related equipment. Nameplates shall be laminated plastic, with 1/8 inch engraved letters, and shall be securely fastened to the circuit breakers.

E. Raceways:

1. General:
   a. Except as otherwise indicated on drawings, conduit shall be concealed in finished areas and exposed in unfinished areas.
   b. Rigid steel conduit and aluminum conduit connections and terminations shall be reamed, de-burred, threaded and provided with bushings.
   c. Securely fasten conduit connections to sheet metal enclosures with locknuts inside and out. Conduit hubs outdoors and in wet locations.
   d. Provide deflection fittings across structural joints where structural movement is allowed.
   e. Keep conduit clear of structural openings and indicated future openings.
   f. Provide flashing and seal watertight conduits through roofs and metal walls.
   g. Neatly grout conduit into any opening cut into structure.
   h. Cap or plug conduits during construction to prevent the entrance of trash, dirt and water.
   i. Minimum conduit size shall be ¾", except ½" for luminaries pendants or as noted on drawings.
   j. Seal conduits with flexible sealing compound forced to a minimum depth equal to the conduit diameter after cable is installed.
      i) At handholes, manholes, and vaults.
      ii) Building entrance junction boxes.
      iii) One inch or larger connections to equipment.
      iv) All conduits exiting the UV area.
      v) All conduits exiting chemical rooms.
   k. Provide flexible conduit where flexible connections are necessary, including each motor without flexible cord.

i) Keep length to a minimum, not to exceed 6’ maximum.
ii) No sharp bends.

l. Provide suitable pull string in each empty or spare conduit.

2. Conduit exposed in structures:
   a. Install parallel to structural members and surface.
   b. Install conduits of the same general routing parallel with symmetrical bends.
   c. Arrange supports to prevent misalignment during wiring installation.
   d. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
   e. Group related conduits; support using conduit rack. Construct rack using steel channel provide space on each for 25 percent additional conduits.
   f. Install no more than equivalent of three 90° bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size.
   g. Provide suitable pull string in each empty conduit except sleeves and nipples.
   h. Maintain 6” clearance to ducts, piping and flues.
   i. Support rigidly with galvanized or cadmium-plated hardware and framing materials, including nuts and bolts.
   j. Provide expansion fittings at 100’ centers outdoors, 200’ centers indoors; in each conduit run longer than 100’ outdoors, 200’ indoors.
   k. Provide galvanized pipe caps on conduit stubs for future use.
   l. Allow 7’ headroom for horizontal conduit runs, except along structures, piping equipment or where not possible.
   m. Except as otherwise indicated, do not install exposed conduit in water chambers.
   n. Where allowed, coat conduit exposed in water chambers with 2 coats of coal tar paint with paint injuries repaired or use PVC coated conduit.

3. Conduit concealed in structure:
   a. Install between reinforcing steel in slabs with reinforcing in both faces.
   b. Install under reinforcing steel in slabs where only a single layer is provided.
   c. Terminate conduit for future use in equipment or by galvanized couplings and conduit plugs flush with structural surfaces. Seal plugs with self-leveling caulk.
   d. Maximum of two conduits crossing each other in slab.

4. Underground:
   a. One inch minimum.
   b. Encased in concrete.
      i) Two inches between conduits.
      ii) Three inches over conduit where not reinforced.
      iii) Three inches over reinforcing.
      iv) Reinforced at and 5’ past portion on disturbed earth or subject to traffic.
      v) Reinforced within 5’ of a structure, manhole or vault.
      vi) Reinforced for entire length and 2’ beyond each adapter to steel conduit if non-metallic is used in duct bank.
      vii) Where capped underground, reinforce the last 2’ and extend steel and conduit 2’ past end of duct bank. Paint all un-encased metal with 2 coats of coal tar paint.
      viii) Continue encasement on outdoor risers to 3” above grade and crown and chamfer top.
   c. Two foot minimum bend radius at vertical risers, 3 foot elsewhere.

d. Install underground conduit so that it does not drain to cable pulling access in buildings; where necessary, provide a handhole or manhole near or adjacent to building.
e. Provide 3 foot minimum earth cover.
f. Install underground conduits through buildings, manhole, handhole and vault walls in box outs as indicated on the drawings.
g. All steel inside manholes, handholes and vaults shall be galvanized with bared spots treated with zinc rich paint.
h. Provide ¾" galvanized steel pulling eyes on opposite walls below the centerline of each duct bank.
i. Provide end bells at wall terminations and adapters for steel conduit continuations for non-metallic duct systems.
j. Isolate intercommunication and milliampere level instrumentation circuits from all power wiring raceways, conduits, boxes, vaults, manhole and handhole.
k. Provide a full-size extension for each underground conduit entering a building.
l. Rigid nonmetallic conduit (PVC) shall be fastened no less than every 4 feet.

5. Junction boxes and wiring gutters:
a. Install electrical boxes as shown on drawings and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
b. Install pull boxes and junction boxes to maintain headroom and to present neat mechanical appearance.
c. Install level and plumb.
d. Where indicated, provide a removable side opposite underground duct banks.
e. At least code size including space for full size continuation of any conduit not originally continued.
f. Arrange conduit for maximum space for future conduits.
g. Support boxes independently of conduit except cast box that is connected to rigid metal conduits both supported within 12 inches of box.

F. Wire and Cable
1. General:
a. Protect the cable and avoid kinking conductors, cutting or puncturing jackets, contaminating by oil or grease or damaging in any manner.
b. Terminate stranded cable with lugs, cup washers, or pressure type connectors; do not wrap stranded cable around screw type terminals.
c. Splice stranded cable with pressure type connectors; do not use wire nut type connectors on stranded cable.
d. Splice cables only at readily accessible locations.
e. Do not pull cable tight against bushings or press heavily against enclosures.
f. Use cable pulling lubricants as recommended by the cable manufacturer.
g. Use swab to clean conduits and ducts before pulling cables.
h. Install cable and accessories in accordance with manufacturer's instructions.
i. Where necessary to prevent heavy loading of cable connectors due to cable weight, support cables in vertical risers with woven cable grips.
j. Coil and tape spare cable ends.
k. Support each 250 MCM or larger cable, and each conduit group of smaller cables from manholes, handholes or vault walls.
l. Use Stranded conductor for feeders and branch circuits.
m. Use stranded conductors for control circuits.

n. Use conductor not smaller than 12 AWG for power and lighting circuits.
o. Use conductor not smaller than 16 AWG for control circuits.
p. Use 10 AWG conductors for 20 ampere, 120 Volt branch circuits longer than 100 feet.
q. Pull all conductors into raceway at same time.
r. Use suitable wire pulling lubricant for building wire 8 AWG and larger.
s. Protect exposed cable from damage.
t. Neatly train and lace wiring inside boxes, equipment, and panel boards.
u. Clean conductor surfaces before installing lugs and connectors.
v. Make splices, taps, and terminations to carry full ampacity of conductors.

2. Special cables:
   a. Isolate networking and milliampere level instrumentation cables from all power circuits.
   b. Isolate telephone cables from all other circuits.
3. Conductor identification:
   a. Color code all service, feeder, and branch circuit conductors, 277/480 VAC and above as follow:
      i) Phase A: Brown
      ii) Phase B: Orange
      iii) Phase C: Yellow
      iv) Neutral: White
      v) Ground: Bare or Green
   b. Color code all feeder, and branch circuit conductors, 120/208 VAC as follows:
      i) Phase A: Red.
      ii) Phase B: Black.
      iii) Phase C: Blue.
      iv) Neutral: White.
      v) Ground: Bare or Green.
   c. Identify single control conductors by color coding orange and by labeling each end of conductors by color coding orange and by labeling each end of conductor with heat shrink-tube type wire markers.
   d. Identify multi-conductor instrumentation and control cables with heat shrink-tube type wire markers.
   e. Contractor shall establish a control and instrumentation conductor and cable identification system acceptable to Engineer.

G. Wiring Devices:
1. Flush mount wiring devices in concealed conduit system.
2. Surface mount wiring devices in exposed conduit systems.
3. Provide extension rings to bring outlet boxes flush with finished surface.
4. Clean debris from outlet boxes.
5. Install products in accordance with manufacturer's instructions.
6. Install devices plumb and level.
7. Install switches with OFF position down.
8. Install receptacles with grounding pole on bottom.
9. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
10. Connect wiring devices by wrapping conductor around screw terminal.
11. Use jumbo size plates for outlets installed in masonry walls.

12. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
13. Install wall switch 48 inches above finished floor.
14. Install convenience receptacle 24 inches above finished floor.
15. Inspect each wiring device for defects.
16. Operate each wall switch with circuit energized and verify proper operation.
17. Verify that each receptacle device is energized.
18. Test each receptacle device for proper polarity.
19. Test each GFCI receptacle device for proper operation.
20. Adjust devices and wall plates to be flush and level.

H. Grounding Materials:
1. Coordinate installation with other disciplines.
2. Verify that final backfill and compaction has been completed before driving rod electrodes.
3. Install Products in accordance with manufacturer's instructions.
4. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
5. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing.
6. Provide bonding to meet Regulatory Requirements.
7. Install ground cable through building walls within 3' below finish grade and prepare a water stop.
8. Install ground rods and cables as deep in earth as possible and as far from structure as possible, not closer than 6".
9. All branch circuit and feeder circuits to include a copper ground conductor in addition to the conduit ground connection.
10. Connect ground conductors to equipment by ground lugs or clamps.
    a. If no ground bus or terminal is provided and enclosure is not explosion-proof or submersible provide a clamp type lug under a permanent assembly bolt or by grounding locknuts or bushings.
    b. If an explosion-proof or submersible enclosure is not provided with grounding means, provide an adjacent junction box with a ground lug.
    c. Bond grounding system to station piping by connection to the first flange inside the building on either a suction or discharge pipe which will form a good ground connection:
        i) Drill and tap the flange.
        ii) Provide a bolted connection.
        iii) Bond with a copper bar or strap.
    d. Form ground conductors on equipment to the contours of the equipment.
    e. Install main ground cables with encased underground conduit banks in earth at least 3" below 1 corner of the duct bank.
    f. Bond ground cables in underground circuits to main ground cables at each manhole, handhole, and vault.

I. Luminaries
1. Install in the general locations and arrangement indicated on drawings.
2. Align luminaries in rows vertically and horizontally except as otherwise required.

3. Install clear of pipes, mechanical equipment, structural openings, indicated future equipment and structural openings, and other obstructions.
4. Adjust luminaries location as required by field conditions.
5. Examine each luminaries to determine suitability for lamps specified.
6. Install in accordance with manufacturer's instructions.
7. Install suspended luminaries using pendants supported from swivel hangers. Provide pendant length required to suspend luminaries at indicated height.
8. Support luminaries larger than 2x4 foot size independent of ceiling framing.
9. Locate recessed ceiling luminaries as indicated on reflected ceiling plan.
10. Install surface mounted luminaries and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
11. Install recessed luminaries to permit removal from below.
12. Install accessories furnished with each luminaire.
13. Bond products and metal accessories to branch circuit equipment grounding conductor.
14. Install specified lamps in each luminaire emergency lighting unit and exit sign.
15. Operate each luminaire after installation and connection. Inspect for proper connection and operation.
16. Aim and adjust luminaries as directed.
17. Relamp luminaries that have failed lamps at Substantial Completion.
18. Clean electrical parts to remove conductive and deleterious materials.
19. Remove dirt and debris from enclosure.
20. Clean photometric control surfaces as recommended by manufacturer.
21. Clean finishes and touch-up damage.

J. Lighting Panel
1. Wall mount in unfinished areas, flush mount in finished areas.
2. Install lighting panel in accordance with NEMA PB 1.1.
3. Install lighting panel plumb. Provide supports. Height: 6 ft. to top of lighting panel; install lighting panel taller than 6 ft. (2M) with bottom no more than 4 in. above floor.
4. Provide filler plates for unused spaces in lighting panels.
5. Provide typed circuit directory for each branch circuit in lighting panel. Revise directory to reflect circuiting changes required to balance phase loads.
6. Measure steady state load currents at each lighting panel feeder; rearrange circuits in the lighting panel to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
7. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

K. Networking – EtherNet/IP cabling
1. Install sufficient networking cable, as shown in the contract drawings, to provide a complete networked system.
2. Terminate all wiring with RJ-45 connectors rated for Cat 5e cable transmissions.
3. Test every communication cable, and provide a testing certificate with the results.

3.2 FIELD QUALITY CONTROL

A. Low Voltage Cable Testing

1. Test 600 V power cables for continuity and freedom from short circuits and ground, except where grounding is intentional immediately after installation.
2. Test all circuits with a 500 V megger or its equivalent.
3. Replace conductors which read less than 1.5 Megaohms between conductors and ground.

3.3 PROTECTION AND STORAGE

A. Protection of equipment during storage:
   1. During construction, all electrical equipment shall be protected against absorption of moisture, and metallic components shall be protected against corrosion. This protection shall be provided immediately upon receipt of the equipment and shall be maintained continuously. Any means necessary shall be used to protect the equipment at the Contractor's expense.

END OF SECTION

SP-12 SECTION 16900 INSTRUMENTATION AND CONTROLS

PART 4 GENERAL

4.1 SUMMARY

A. This section covers the furnishing and installation of metering and control equipment which shall include the following principal items:
   1. Metering and Control Systems. Principal components of the metering and control systems shall be as listed on the "Instrument List" at the end of this section and shall include modification to the existing PLC system.

B. Related Sections
   1. Section 01600 – Materials and Equipment
   2. Section 16050 – Basic Electrical Materials & Methods
   3. Section 16150 – Variable Frequency Drives
   4. Section 16480 – Motor Control Centers
   5. Section 16950 - PLCs

4.2 REFERENCES

A. Codes & Permits
   1. All work and materials shall comply with the National Electrical Code, the National Electrical Safety Code, and applicable local regulations and ordinances. All panels shall be listed by Underwriters Laboratories or other testing organizations acceptable to the governing authority. The Contractor shall, at his own expense, arrange for and obtain all necessary permits, inspections, and approval by the proper authorities in local jurisdiction of such work.

4.3 SUBMITTALS

A. Complete fabrication, assembly, and installation drawings: wiring and schematic diagrams: and details, specifications, and data covering the materials used and the parts, devices, and accessories forming a part of the equipment furnished shall be submitted in accordance with the submittals section. Submittal data shall be grouped and submitted in two separate stages. The submittal for each stage shall be substantially complete. Individual drawings and data sheets submitted at random intervals will not be accepted for review. Instrument tag numbers indicated on the contract drawings shall be referenced where applicable. Submittal data for multifunctional instruments shall include complete descriptions of the intended functions and configurations of the instruments.
   1. First-stage Submittal. The first-stage submittal shall include the following items.
      a. Product catalog cut sheets clearly marked to show the applicable model number, operational features, and intended service of the device.
      b. A detailed list of any exceptions, functional differences, or discrepancies between the Supplier's proposed system and the contract requirements.
      c. Complete panel fabrication drawings and details of panel wiring, piping, and painting. Panel and subpanel drawings shall include overall dimensions, metal thickness, door

swing, mounting details, and front of panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices.

d. System wiring and installation drawings for all interconnecting wiring between components of the systems furnished and for all interconnecting wiring between the related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections.
e. If panel terminal designations, interdevice connections, device features and options, or other features are modified as a result of the fabrication process or factory testing, revised drawings shall be resubmitted.
f. A total of seven (7) copies for the submittal shall be provided.

2. Second-stage Submittal. Complete system documentation, in the form of operation and maintenance manuals, shall be provided. Manuals shall include complete product instruction books for each item of equipment furnished.
   a. Where instruction booklets cover more than one specific model or range of instrument, product data sheets shall be included which indicate the instrument model number, calibrated range, and all other special features. A complete set of "as-built" wiring, fabrication, and interconnection drawings, calibration and startup sheets shall be included with the manuals.
   b. A copy of all final O&M manuals shall be provided in PDF format in a CD-ROM or DVD. All AutoCAD drawings shall be provided in PDF and DWG formats.
   c. A total of five (5) printed copies, and ten (10) softcopies of final O&M manuals shall be provided.

4.4 QUALITY ASSURANCE

A. Supplier's qualifications
   1. The entire system shall be designed, coordinated, and supplied by a qualified system integrator (Integrator) who is regularly engaged in the business of designing and building instrument and control systems for water and wastewater projects. The Contractor's intended Integrator shall meet the following qualifications.
      a. The Integrator shall have and shall maintain a qualified technical staff and design office. The qualifications and experience of key project personnel shall be acceptable to the Engineer.
      b. The Integrator shall have the physical plant and fabricating personnel to complete the work specified. The Integrator's fabrication capabilities and arrangements shall be acceptable to the Engineer.
      c. The Integrator shall employ competent service personnel to service the equipment furnished. The Integrator shall have a minimum of 5 service personnel that are full time employees of the company that reside within the state of Colorado.
      d. The Integrator shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.

B. Coordination.
   1. Instrument and control systems shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All instruments and control devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufactured and the manufacturer of related equipment.

2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
3. The Integrator shall provide coordination with other contractors and supervision of installation as required during construction.
4. Coordination shall be provided between the Integrator and the process system supplier.
5. Instrument and control systems shall be designed and coordinated for proper operation with other sections of these specifications. These shall include but not be limited to Materials and Equipment – Section 01600, Electrical – Section 16050, Variable Frequency Drives – Section 16150, and Programmable Logic Controllers – Section 16950.

4.5 WARRANTY

A. All suppliers shall warrant their hardware for a period of one year from the date of system acceptance.

PART 5 PRODUCTS

5.1 GENERAL REQUIREMENTS

A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
   1. Power and Instrument Signals. Unless specified otherwise, electrical power supply to the instrumentation equipment will be unregulated 120 VAC at the locations noted on the one-line and functional diagrams. All transmitted electronic analog instrument signals shall be 4-20 mA DC and shall be linear with the measured variable.
   2. Metering Accuracy. System metering accuracy, as compared to the actual process value, shall be determined from the value read at the principal readout device such as the recorder or totalizer. System requirements shall not preclude any requirements specified herein for individual devices.
      a. For systems where the primary measuring device, transmitter, and receiver are furnished under this section, the accuracies shall be within the following limits:
         i) Level: 1.0% percent of measured span.
         ii) Flow Rate: magnetic or transit time ultrasonic metering: 1.5 percent of full scale between 1.0 and 100 percent of scale.
   3. Appurtenances. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation requirements shall be furnished and installed as required for proper performance of the equipment.
   4. Interchangeability and Appearance. Instruments used for the same types of functions and services shall be of the same brand and model line insofar as possible. Similar components of different instruments shall be from the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished. Recorders, process indicators, control stations, and similar panel-mounted

instruments shall be of the same style and shall be products of the same major instrument manufacturer.

5. Programming Devices. A programming or system configuring device shall be provided for systems that contain any equipment which required such a device for routine calibration, maintenance, and troubleshooting. The programming device shall be complete and in like-new condition and shall be turned over to the Owner at completion of the startup.
6. Device Tag Numbering System. All devices shall be provided with permanent identification tags. The tag numbers shall agree with the instrument device schedules and with the supplier's equipment drawings. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanels, and rack-mounted devices shall have laminated plastic identification tags securely fastened to the device. Hand lettered labels or tape labels will not be acceptable.
7. Special Tools and Accessories. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

5.2 PANEL FABRICATION

A. General Fabrication Requirements. All panels furnished hereunder shall conform to the requirements of NEMA ICS-6-1988. The following paragraphs describe general fabrication requirements for the instrument panels, consoles, enclosures, and subpanels:

1. Wiring.
   a. All internal instrument and component device wiring shall be as normally furnished by the manufacturer. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded tinned copper, insulated for not less than 600 volts, with a moisture-resistant and flame-retardant covering rated for not less than 90°C.
   b. The power entrance to each panel shall be provided with a surge protection device. Surge protectors shall be nominal 120 VAC. Surge protectors shall be of a non-faulting and non-interrupting design, with a response time of not more than 5 nanoseconds. Surge protectors shall be Cutler Hammer AEGIS Powerline Filters, or equal.
   c. Panels that are over 15 cubic feet in total volume shall have panel lighting above each door of the panel.
   d. Power distribution wiring on the line side of the panel's protective devices shall be minimum 12 AWG. Secondary power distribution wiring shall be minimum 16 AWG. Wiring for control circuits shall be minimum 16 AWG. Electronic analog circuits shall be 18 AWG twisted and shielded pairs rated not less than 300 volts. Analog circuits shall be separated from ac power circuits. Wiring for ac power distribution, dc power distribution, and control circuits shall have different colors and shall agree with the color coding legend on the system supplier's panel wiring diagrams.
   e. Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with a marking strip, covers, and pressure connectors. Terminals shall be labeled to agree with identification shown on the supplier's submittal circuits, plus one ground for each shielded cable. Not less than 8 inches of clearance shall be

provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 20% percent spare terminals shall be provided. Each control loop or system shall be individually fused, and all fused or circuit breakers shall be clearly labeled and located for easy maintenance. Terminal block shall be Phoenix Contact UT 4-MTD series.

f. All wiring shall be grouped and firmly supported inside the panel. Wiring shall be routed in nonmetallic slotted wire duct or similar. Ducts shall be readily accessible within the panel with removable covers and shall have a space of at least 40 percent of the depth of the duct available for future use after installation is complete and all field wiring installed. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables. Wire duct shall be Thomas & Betts Ty Duct or approved equal.
g. Where signal or loop wiring must be routed to more than one panel or device, the required circuit routing shall be as indicated on the one-line diagrams.
h. All analog input signals coming from external from the building where the panel is located shall have surge protection.
i. The panel fabricator shall provide such additional circuits as may be indicated on the electrical schematic drawings.
j. All wires in the panel shall be identified at both ends of the wire. These labels shall agree with the labels shown on the wiring diagrams. The wire labels shall be of the heat-shrink tube type of wire marker as manufactured by Brady thermal labels.
k. All instruments that require 120vac power that have the signal from the instrument going to a panel, shall be provided 120vac from that panel. The 120vac circuit to these instruments shall be individually fused.

2. Nameplates. Nameplates shall be provided on the face of the panel or on the individual device as required. Panel nameplates shall have approximate dimensions and legends, as indicated on the drawings, letters approximately 3/16 inch high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel. Panel face nameplates do not replace the requirement for device identification tags as specified herein under the Device Tag Numbering System paragraph.
3. Painting. Interior and exterior surfaces of all panels shall be thoroughly cleaned and painted with rust-inhibitive primer. The panel interior shall be painted white with the manufacturer's standard coating. All pits and blemishes in the exterior surface shall be filled. Exterior surfaces shall be painted with one or more finish coats of the manufacturer's standard coating. Finish coats shall have a dry film thickness of at least 4 mils.
4. Factory test. Panels shall be factory tested electrically by the panel fabricator before shipment.

5.3 METERING & CONTROL SYSTEMS

A. Principal components for the metering and control systems are indicted on the "Instrument List" at the end of this specification.

5.4 MATERIALS & EQUIPMENT

A. Panel Front-Mounted Devices
1. SELECTOR SWITCHES. Selector switches shall be a minimum 30 mm, heavy-duty, oil-tight type with gloved-hand or wing lever operators. Position legends shall be engraved on the switch faceplate. Switches for electric circuits shall have silver butting or

sliding contacts, rated 10 amperes continuous at 120 volts ac. Contact configuration shall be as indicated on the drawings or as required for the application. Switches used in electronic signal circuits shall have contacts suitable for that duty. Switches shall be Cutler-Hammer "Series 10250T", Square D "Class 9001", or approved equal.

2. INDICATING LIGHTS. Indicating lights shall be a minimum 30 mm, heavy-duty, oil-tight type, Push-to-Test, which uses a low voltage lamp. A built-in transformer shall be used for AC service. Legends shall be engraved on the lens or on a legend faceplate. Lamps shall be easily replaceable from the front of the indicating light. Indicating lights shall be Cutler-Hammer "Series 10250T", Square D "Class 9001", or approved equal.
3. PUSH BUTTONS. Push buttons shall be a minimum 30 mm, heavy-duty, oil-tight type. Legends shall be engraved on push button faceplate. Contacts shall be rated 10 amperes continuous at 120 VAC. Push buttons shall be Cutler-Hammer "Series 10250T", Square D "Class 9001", or approved equal.
4. RUN TIME METERS. Run time meters shall have miniature, rectangular, semi-flush counters. The counter shall contain not less than seven digits, with a nameplate plainly engraved on the face of the counter, or below the counter identifying it as a run time meter. Run time meters shall not reset upon power failure. Run time meters shall be as manufactured by Red Lion "CUB7" series or Action Instruments.
5. DIGITAL PANEL DISPLAYS. Digital panel displays shall be designed for semi-flush mounting in a panel. The display shall be a 3-1/2 digit LED or gas-discharged type, with digit height of not less than 0.5 inch. The display shall be easily read at a distance of 10 feet in varying control room lighting environments. Operating temperature range shall be 0 to 40 C. Accuracy shall be plus or minus 0.1 percent. The display shall be scaled in engineering units, with the units engraved on the display face or on the associated nameplate. The display shall have selectable decimal point and shall provide red indication. Digital displays shall be as manufactured by Red Lion "PAXP" series or Action Instruments.

B. Panel Interior-Mounted Devices
   1. POWER SUPPLIES. Regulated DC power supplies for instrument loops shall be provided as needed. Power supplies shall be suitable for input voltage variation of plus or minus 10 percent. The DC power supplies shall be Idec "PS5R Slim line", or Phoenix Contact "Quint".
   2. RELAYS. Relays indicated to be provided in panels, enclosures, or systems furnished under this section shall be of the plug-in socket base type with dustproof plastic enclosures unless noted otherwise. Relays shall be UL listed. Relays shall have a minimum rating of 10 amperes at 120 VAC. Time-delay relays shall have dials or switch settings engraved in seconds and shall have timing repeatability of +/- 2.0 percent of setting. Latching and special purpose relays shall be as required for the specific application. Relays shall have a light to indicate when coil is energized. Relays shall be Idec "RH or RTE Series" or approved equal.
   3. ELECTRONIC SIGNAL BOOSTERS AND ISOLATORS. Electronic Signal Boosters and Isolators shall have all solid-state circuitry and complete electrical isolation between the power supply and the input and output signals. Accuracy shall be +/-0.15 percent of span. Isolators shall be manufactured by Acromag, Moore, or Phoenix Contact.

C. Flow Instrumentation
   1. Magnetic Flow Meters

a. The Magnetic Flow Meter shall be a completely obstructionless, in-line flow meter with no constrictions in the flow of fluid through the meter. The meter shall consist of a metallic tube with flanged ends and with grounding rings. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME B16.5, Class 150. Meters shall be suitable for the maximum range of working pressures of the adjacent piping. Electrode materials shall be fully compatible with the process fluid and shall comply with the requirements specified in the instrument device schedules. Each meter shall be factory calibrated, and a copy of the calibration report shall be submitted as part of the operation and maintenance manual submittal.
b. The meter shall be capable of standing empty for extended periods of time without damage to any components. The meter housing shall be of a splash-proof and drip-proof design
c. Power supply to the meter shall be 120 VAC, 60 Hz, single phase.
d. Meters shall be Spirax Sarco MagFlow Series, no or equal.

2. Magnetic Flow Meter Signal Converters
   a. Magnetic Flow Meter Signal Converters shall be separately mounted, microprocessor-based signal converters. They shall be provided for the magnetic flow meters. The signal converters shall include output dampening, self-testing, integral digital indicator, built-in calibration capability, and an "empty pipe zero" contact input. The overall accuracy of the magnetic flow meter transmitter and signal converter shall be +/-1.0 percent of actual flow rate for full-scale settings of 0.3 to 30 fps. The signal cable between the converter and the magnetic flow meter shall be furnished by the meter manufacturer. The signal converter shall be housed in NEMA Type 12 housing and shall be suitable for operation over an ambient temperature range of -30° to +140°F, and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA DC.
   b. The signal converter shall have a seven-digit, non-reset totalizer on the face of the enclosure. Local electronic indicators shall be provided. Indicators shall be mounted on or near the flow meter signal converters in weatherproof NEMA Type 4 housings. Indicators shall be four-digit LCD type and shall read in engineering units.
3. Open Channel Ultrasonic Flowmeters
   a. Each ultrasonic flowmeter shall be a microprocessor-based electronic unit consisting of a sensor assembly, a signal converter/transmitter, and an interconnecting cable. The sensor shall be encapsulated in a chemical- and corrosion-resistant material such as keener or CPVC, and shall be suitable for operation over a temperature range of -20 to +150° F and a relative humidity of 10 to 100 percent. The sensor shall be compatible with the process media being measured. The sensor shall be an explosion-proof design suitable for use in all hazardous areas. Sensors mounted in areas subject to freezing shall be provide with special transducers or protected against icing by heaters. Sensors mounted in direct sunlight shall be provided with sunshades.
   b. The supplier shall furnish drawings complete with dimensions and elevations for the sensor mounting.
   c. The ultrasonic flowmeter shall have automatic compensation for changes in air temperature at the sensor location. If separate temperature sensing probes are provided, they shall be mounted with or adjacent to the ultrasonic sensor, as recommended by the manufacturer. The transmitter shall have a four-digit LCD display scaled to read in engineering units. Digit height shall be approximately 0.5 inch. The transmitter shall be designed to ignore momentary level spikes or

momentary loss-of-echo. A loss-of-echo condition shall be indicated on the transmitter unit and shall be available as an alarm contact output. The transmitter output shall be an isolated 4-20 mA DC signal linearly proportional to the measured level range. Where specified, the output shall be characterized to be proportional to the tank volume instead of to the tank level. Calibration parameters shall be entered through a keypad on the unit and shall be stored in nonvolatile EEPROM memory. Accuracy of the transmitted signal shall be +/-0.5 percent of the flow range.

d. The transmitter shall contain a minimum of three (3) independently adjustable alarm contact outputs. Contacts shall be single-pole, double-throw, rated not less than 5 amperes at 120 VAC.
e. A sufficient length of sensor-to-transmitter signal cable shall be furnished with the instrument to locate the sensor 25 to 200 feet from the signal converter. The signal converter electronics shall be housed in a NEMA Type 12 enclosure suitable for wall mounting and for operating temperatures of -15 to +125°F and a relative humidity of 10 to 100 percent. The signal converter shall be powered from 120 VAC, 60 Hz. The ultrasonic flowmeter shall be Siemens "HydroRanger 200" or approved equal.
f. The transducer shall be Siemens "XRS-5", or equal.

4. Pressure and Level Instrumentation
   a. Pressure and Pressure Sensing Level Transmitters.
      i) Transmitters used to measure process pressure, or inferred level from process pressure such as a bubbler system or other source, shall have all solid-state electronic circuitry and shall be of the two-wire type which requires no direct power connection to the transmitter. Transmitters shall have self-diagnostics and electronically adjustable span, zero, and damping. Transmitters shall be enclosed in a NEMA Type 4X housing and shall be suitable for operation at temperatures from 0 to 180 F. All transmitter parts shall be of a corrosion-resistant material. Vents shall be provided on the sides of the diaphragm housing body. Transmitter shall have over-range protection to maximum process line pressure. Accuracy shall be plus or minus 0.5 percent of calibrated span, with repeatability of 0.1 percent. Transmitter output shall be 4-20mA dc without the need for external load adjustments and shall have an elevated or suppressed zero as required by the application. Transmitters shall be furnished with integral indicators with 0-100 percent linear scales.
      ii) Differential type transmitters shall be used if required to meet the input range, elevation, or suppression requirements.
      iii) Each transmitter shall be provided with a process shutoff valve and a bracket for mounting as required. Transmitters shall be factory calibrated to the required range. Transmitters shall be Rosemount "Model 2088" or approved equal.
   b. Ultrasonic Level Transmitters
      i) Each ultrasonic level transmitter shall be a microprocessor-based electronic unit consisting of a sensor assembly, a signal converter/transmitter, and an interconnecting cable. The sensor shall be encapsulated in a chemical- and corrosion-resistant material such as keener or CPVC, and shall be suitable for operation over a temperature range of -20 to $+150^{0}$F and a relative humidity of 10 to 100 percent. The sensor shall be compatible with the process media being measured. The sensor shall be an explosion-proof design suitable for use in all hazardous areas. Sensors mounted in areas subject to freezing shall be provide with special transducers or protected against icing by heaters. Sensors mounted in direct sunlight shall be provided with sunshades.

ii) The supplier shall furnish drawings complete with dimensions and elevations for the sensor mounting.

iii) The ultrasonic level transmitter shall have automatic compensation for changes in air temperature at the sensor location. If separate temperature sensing probes are provided, they shall be mounted with or adjacent to the ultrasonic sensor, as recommended by the manufacturer. The transmitter shall have a four-digit LCD display scaled to read in engineering units. Digit height shall be approximately 0.5 inch. The transmitter shall be designed to ignore momentary level spikes or momentary loss-of-echo. A loss-of-echo condition shall be indicated on the transmitter unit and shall be available as an alarm contact output. The transmitter output shall be an isolated 4-20 mA dc signal linearly proportional to the measured level range. Where specified, the output shall be characterized to be proportional to the tank volume instead of to the tank level. Calibration parameters shall be entered through a keypad on the unit and shall be stored in nonvolatile EEPROM memory. Accuracy of the transmitted signal shall be +/-0.5 percent of the level range.

iv) The transmitter shall contain four independently adjustable level alarm contact outputs. Contacts shall be single-pole, double-throw, rated not less than 5 amperes at 120 volts ac.

v) A sufficient length of sensor-to-transmitter signal cable shall be furnished with the instrument to locate the sensor 25 to 200 feet from the signal converter. The signal converter electronics shall be housed in a NEMA Type 12 enclosure suitable for wall mounting and for operating temperatures of -15 to $+125^{0}$F and a relative humidity of 10 to 100 percent. The signal converter shall be powered from 120 volts ac, 60 Hz. The ultrasonic level transmitter shall be Siemens "Multiranger", Endress Hauser, or approved equal.

c. Weighted Float Level Switches

i) Each level switch shall consist of a single-pole, double-throw switch, rated not less than 3 amperes AC, sealed and housed in a chemical-resistant polypropylene casing. The switch assembly shall be weighted and suspended on its own cable. The flexible support cable shall be waterproof, three-conductor, synthetic covered cable with 18AWG conductors, and shall be of sufficient length so that no splice or junction box is required in the wetwell. Switches shall be suitable for operation up to 150 volts within an ambient temperature range of 0° to 60° C. Switches shall be suitable for use in a sanitary or wastewater wetwell environment. Installation hardware shall be provided as shown on the drawings or as necessary for application. Switches shall be Flygt "Type EMN-10", Siemens Water Technologies "Model 9G-EF", or approved equal.

d. Pressure Switches

i) Pressure switches shall be field adjustable and shall have a trip point repeatability of better than 1 percent of actual pressure. Contact rating shall be 10 amperes at 120 volts ac.

ii) Switches shall have over-range protection to maximum process line pressure. Switches shall have NEMA type 4X housings.

iii) Switches shall be as manufactured by Ashcroft, Mercoid, United Electric, or equal.

e. Conductance Relay Level Switch

i) Each level switch shall consist of a single-pole, double-throw relay with contacts rated not less than 5 amperes ac at 120 VAC. The relay primary power shall be

120 VAC. The electrodes shall be flexible wire suspension type with shielded stainless steel electrode tips. The electrode holder shall be the manufacturer's standard holder appropriate for the application. Electrodes and conductance relay shall be as manufactured by Gems Sensors (B/W Controls) or Ametek (Warrick Controls), or approved equal.

5. Analytical Instruments
   a. Analytical Analyzer
      i) Manufacturer shall be XYLEM, YSI, no exceptions
      ii) EX03 Sonde sensor holder with central wiper
      iii) EXO wiped Conductivity/Temperature sensor
      iv) EXO ISE01 pH Sensor assembly
      v) EXO Turbidity Sensor
      vi) EXO central wiper, EXO2
      vii) EXO 10 meter Flying lead cable
      viii) EXO Signal Output Adapter (USB)
      ix) Loggernet Data Logger Software
      x) Campbell CR310 Measurement and control datalogger
      xi) Custom written firmware to allow for Ethernet communications

PART 6 EXECUTION

6.1 INSTALLATION REQUIREMENTS

A. General Requirements
   1. The instrumentation equipment shall be installed by the Contractor or his subcontractors in accordance with the manufacturers' instructions. The services of the system Supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation.

B. Inspection.
   1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
      a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

C. Equipment Installation.
   1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
      a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
      b. Perform all work in accordance with manufacturer's instructions.
         i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
         ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
      c. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.

d. Field Piping. Field piping materials and installation shall conform to the requirements of the miscellaneous piping section.
e. Field-Mounted Instruments. Instruments shall be mounted so they may be easily read and serviced and all appurtenant devices are easily operated. Installation details for some instruments are indicated on the drawings. Unless otherwise indicated on the drawings, instruments which include local indicators shall be mounted approximately 5 feet above the floor and shall be oriented for ease of viewing. Transmitters shall be mounted on corrosion-resistant pipe supports suitable for floor, wall, or bracket mounting.

D. Field Calibration. A technical representative of the system supplier shall calibrate each instrument and shall provide a written calibration report for each instrument, indicating the results and final tuning adjustment settings. The adjustment of each calibrated instrument shall be sealed or marked, insofar as possible, to discourage tampering. Instruments shall be calibrated before checkout of the operation of the system.

E. Systems Check. A technical representative of the system supplier shall participate in the checkout of metering and control systems. If interrelated devices furnished by other suppliers, such as valve actuators, motor controls, chemical feeders, or primary measuring devices, do not perform properly when placed in service, the technical representative shall use suitable test equipment to introduce simulated signals to verify or measure signals from such devices as required to locate the source of trouble or malfunction. A written report stating the results of such tests shall be furnished, if requested by the Engineer, to assign responsibility for corrective measures.
1. Installation Test Equipment. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by the Contractor for the duration of the testing work. Unless specified otherwise, test equipment will remain the property of the Contractor or the system Supplier.

F. Adjustment and Cleaning
1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

6.2 CUSTOMER TRAINING

A. The coordinating supplier shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of the equipment. The training session shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of one 2-hour session, and the schedule shall be arranged and coordinated with the Engineer.

6.3 INSTRUMENT LIST

Instrument List

Tag #	Description	Service	Scale	Provided Under Specification
FIT/FE-60	Pipeline flow	Magnetic Flow Meter	0-200 CFS	16900

FIT/FE-70	Bypass flow	Magnetic Flow Meter	0-200 CFS	16900
AIT/AE-80	Analytical signals	Analytical Analyzer		16900

END OF SECTION

SP-13 SECTION 16950 PROGRAMMABLE LOGIC CONTROLLERS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the items listed below and all other components necessary for a complete system as noted herein and indicated on the drawings
   1. Programmable Logic Controllers (PLCs)
   2. Communication equipment
   3. Programming
   4. Spare parts

B. Related Sections
   1. Section 01600 – Materials and Equipment
   2. Section 16050 – Basic Electrical Materials & Methods
   3. Section 16900 – Instrumentation & Controls

1.2 REFERENCES

A. ISA 5.1 – Instrumentation Symbols and Identification

B. NEMA ICS 1 – General Requirements for Industrial Control and Systems

C. NEMA ICS 2 – Standards for Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated 600 Volts

D. DEMA ICS 3 – Industrial Control and Systems: Factory Built Assemblies

E. NEMA ICS 6 – Industrial Controls and Systems: Enclosures

1.3 DESIGN REQUIREMENTS

A. Discrete input/output signals shall be allowed to be 24VDC or 120VAC

B. Analog input/output signals shall all be 4-20mA

C. Analog signal isolators shall be independently powered units capable of driving two 4-20mA signals

D. All required buffers, isolators, signal converter, and amplifiers for coordination with other equipment furnished under other sections, and between items of equipment needed for a complete system shall be furnished under this section of the specifications whether indicated on the Drawings or not or detailed in these specifications or not

1.4 SYSTEM DESCRIPTION

A. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications,

engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

1. I/O List. An I/O list is attached at the end of this section

1.5 SUBMITTALS

A. Submittals shall be required as noted in Section 16900.

1.6 QUALITY ASSURANCE

A. Supplier's qualifications
   1. The entire system shall be designed, coordinated, and supplied by the system integrator supplier.

B. Coordination
   1. The PLCs and PLC system shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment.
   2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
   3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.

1.7 WARRANTY

A. The Supplier shall warrant the hardware, software, and configuration related to the operational performance of the facility for a period of one year from the date of system acceptance.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
   1. Interchangeability. All PLC systems shall be products of the same manufacturer and of the same series or product line. Processors, local and remote input/output hardware, communications modules, and specialty modules shall be interchangeable among all I/O panels and systems.
   2. Installed I/O requirements. Each PLC shall have I/O modules installed to accommodate requirements shown on drawings and the I/O List at the end of this section and with a minimum of 20% spares installed.

3. Acceptable Manufacturers.
    a. PLC - Allen Bradley Compact Logix Series System
    b. PLC – Modicon M340 Series System
    c. No or equal
4. Modules shall be added as needed to provide for all the I/O required on the project plus the spares.
5. PLC shall be provided with Ethernet communications installed and functioning.

B. Programmable Logic Controller (PLC)
1. The PLC system components shall be as noted herein:
    a. Input/Output Modules
        i) Digital Input Modules – Allen-Bradley
            a) Number of Inputs: 16
            b) Voltage Category: 120VAC
            c) Module shall be Allen Bradley 1769-IA16.
        ii) Digital Input Modules - Modicon
            a) Number of Inputs: 16
            b) Voltage Category: 24VDC
            c) Module shall be Schneider Electric BMXDDI1602.
        iii) Digital Output Modules – Allen-Bradley
            a) Number of Outputs: 16
            b) Voltage Category: 120VAC
            c) Module shall be Allen Bradley 1762-OW16.
        iv) Digital Output Modules – Modicon
            a) Number of Outputs: 8
            b) Voltage Category: 120VAC
            c) Module shall be Schneider Electric BMXDRA0805
        v) Analog Input Modules – Allen-Bradley
            a) Number of Inputs: 8
            b) Signal Range: 4-20mA
            c) Module shall be Allen Bradley 1769-IF8.
        vi) Analog Input Modules – Modicon
            a) Number of Inputs: 8
            b) Signal Range: 4-20mA
            c) Module shall be Schneider Electric BMXAMI0810.
        vii) Analog Output Modules – Allen-Bradley
            a) Number of Inputs: 4
            b) Signal Range: 4-20mA
            c) Module shall be Allen Bradley 1769-OF4.
        viii) Analog Output Modules – Modicon
            a) Number of Inputs: 4
            b) Signal Range: 4-20mA
            c) Module shall be Schneider Electric BMXAMO0410.
    b. Processors
        i) Allen-Bradley – 1769-L32E
        ii) Modicon – BMXP342020

C. PLC Programming Software

1. The PLC programming software shall be Allen Bradley RSLogix 5000 for the Allen-Bradley or Unity Pro for the Modicon, no or equal.

D. Operator Interface Terminal (OIT)
   1. An OIT shall be installed in the door of the RTU panel.
   2. The OIT shall be a RedLion G310R210 type operator panel with the following functionality (all accessories shall be provided as needed to accomplish these functions):
      a. 10” display
      b. 800 x 600 display resolution
      c. NEMA 4X front panel
      d. At least one Ethernet port
      e. Capable of storing at least 2 GB for data logging
      f. Provide a minimum of 3 flash storage cards
      g. Provide with remote web access

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General Requirements
   1. It shall be the Supplier’s responsibility to ensure that the entire PLC system and HMI system is installed in a satisfactory condition per these specifications and the manufacturer’s requirements.

B. Inspection
   1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
      a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

C. Equipment Installation
   1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
      a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
      b. Perform all work in accordance with manufacturer's instructions.
         i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
         ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.

D. Adjustment and Cleaning
   1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
   2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

E. PLC Programming.
   1. The Contractor shall be responsible for all PLC programming.

F. OIT Programming
   1. The Contractor shall be responsible for all OIT programming.

3.2 CUSTOMER TRAINING
   1. The system supplier shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of the equipment. The training session shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of one 2-hour session, and the schedule shall be arranged and coordinated with the Engineer.

I/O List

Tag #	Description	DI	DO	AI	AO	Scale	Notes
	Raw Water - Turbidity						Via Ethernet
	Raw Water - Temperature						Via Ethernet
	Raw Water – Conductivity						Via Ethernet
	Raw Water - pH						Via Ethernet
	Diversion Gate #1 – Position Control				1		
	Diversion Gate #1 – Position Feedback			1			
	Diversion Gate #2 – Position Control				1		
	Diversion Gate #2 – Position Feedback			1			
	Bypass Valve Actuator – Position Control				1		
	Bypass Valve Actuator – Position Feedback			1			
FIT-60	Pipeline Flow			1			
FIT-70	Bypass Flow			1			

END OF SECTION

SP-14 SECTION 16951 LOGIC DESCRIPTION

PART 4 GENERAL

4.1 SUMMARY

A. This section includes the items listed below and all other components necessary for a complete system as noted herein and indicated on the drawings
   1. General Programming Requirements
   2. PLC Programming
   3. OIT Programming

B. Related Sections
   1. Section 16900
   2. Section 16950

C. PLC programming services shall be provided by the system integrator.

D. OIT programming shall be completed by system integrator (SI) as outlined below

E. Scope of work shall also include, but is not limited to:
   1. Develop and test new PLC program based on control descriptions provided in this specification section.
   2. Develop and test OIT screens
   3. Loop test all PLC input and output points for proper operation.
   4. Verify new instrument setup and calibration coordinates with the PLC and OIT system
   5. Verify Ethernet communication between PLC and AIT-80 Panel
   6. Verify all communication functionality between PLC and Operator's residence Panel
   7. Provide training to City's personnel on new system.

4.2 REFERENCES

A. ISA 5.1 – Instrumentation Symbols and Identification

B. NEMA ICS 1 – General Requirements for Industrial Control and Systems

C. NEMA ICS 2 – Standards for Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated 600 Volts

4.3 SYSTEM DESCRIPTION

A. All the programming performed under this section shall be done in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the software manufacturer, unless exceptions are noted by engineer.

4.4 SUBMITTALS

A. Submittals shall be required as noted in section 16900.

4.5 QUALITY ASSURANCE

A. Supplier's qualifications
   1. The entire system shall be programmed under this agreement
   2. These control descriptions are provided for informational purposes and for coordination between the system supplier and the programmer.

PART 5 EXECUTION

5.1 GENERAL PROGRAMMING REQUIREMENTS

A. Tag database structure and configuration.
   1. The process control system tag naming convention shall include the definition of all devices, derived and soft tags, and the required alarm processing and data logging definitions for each tag.
   2. All logic and control shall be done in the PLC

B. PLC Programming standards.
   1. General Considerations
      a. Program Documentation
         i) Documentation for all PLC programs shall include comments, tag/register descriptions, or any other programming tags. All PLC programs shall be documented with comments provided for each subroutine, function and/or section. Use of abbreviations in comments and subroutine/section titles should be avoided. At the completion of the project, copies of programming, I/O list, memory map and communications map shall be provided in both printed and electronic format.
      b. Motors
         i) All motors shall have runtime totalizers and start counters. Both values shall be totalized regardless of whether the motors are in auto and manual control modes.
         ii) Every motor that has PLC control shall have a manual or automatic operation for the motor. If manual is selected, then the operator shall be able to start or stop the motor. If the motor is controlled from a VFD then the operator shall be able to enter a speed set point for the VFD. In automatic operation, the control logic shall start and stop the motor as well as control the speed.
         iii) The following signals shall be determined for all motors.
            a) HOA switch in Auto
            b) Run Indication
            c) Fault Indication.
            d) Motor fail to start. PLC calling the motor to run but no run signal report for 20 sec. if the motor is in auto.
            e) Motor fail to stop. PLC not calling the motor to run but a run signal report for 20 sec. if the motor is in auto.
      c. Analog signals
         i) All analog inputs shall be scaled in Engineering units to be used in the logic.
         ii) A low level and high level alarm shall be generated for each analog signal. Each alarm shall have separate alarm and reset set points that shall be operator programmable from the OIT screen.
      d. All control to any devices will be stopped if there is a phase failure condition. After a time delay when the phase failure is normal, then normal operation shall proceed.

C. Operator Interface Terminal (OIT) standards.
   1. General Considerations
      a. In general, when the term OIT is used it indicates the local operator terminal display.
      b. All alarms will be displayed and logged on the OIT.
      c. All analog signals will be trended and logged and displayed on the OIT in engineering units.
      d. Motors
         i) All motors shall be displayed on the OIT and have dynamic graphical indication whether they are on or off. The motors shall be green for running and red for off.
         ii) All motors shall have runtime totalizers and start counters displayed near the motor's graphical display.
         iii) Every motor that has PLC control shall have the associated set points and control criteria entered at the local operator terminal displays. This shall also allow the operator to select manual or automatic operation for the motor. If the motor is controlled from a VFD then the operator shall be able to enter a speed set point for the VFD when the motor is in the manual control mode.
      e. The control signals for all motors shall be displayed on the OIT. They shall include but not limited to:
         i) HOA Switch status: "In Auto", "In Hand" or "Off"
         ii) Run Indication
         iii) Fault Indication
         iv) Motor fail to start. PLC calling the motor to run but no run signal report for 20 sec while the HOA is in Auto.
         v) Motor fail to stop. PLC not calling the motor to run but a run signal report for 20 sec while the HOA is in Auto.
      f. Alarming
         i) All alarms shall be displayed and logged on the OIT screens.
         ii) Selected alarms shall have a visual and audible alarm.

5.2 SPECIFIC DEVICE CONTROL CRITERIA

A. Diversion Gates Control
   1. Water will enter the diversion structure and flow will be controlled by the 2 diversion gates. These gates shall be PLC controlled.
   2. They shall be controlled by a manual operator setpoint entered in percentage on the OIT and the valve will provide position feed back to the PLC.

B. Bypass flow control
   1. The bypass valve shall be controlled by the PLC
   2. The bypass valve shall be controlled by an operator entered flow setpoint so the difference between the FIT-60 flow and the FIT-70 flow matches the operator entered flow setpoint.

C. Flow Calculations
   1. All flows and associated calculated values shall be displayed and logged.
   2. The flow to the reservoir shall be the Pipeline flow (FIT-60) less the bypass flow (FIT-70).
   3. All flows shall be totalized for total daily flow, previous day flow, current month total flow and previous month total flow.

4. All flows shall be in both cubic feet per second (CFS) and million gallons per day (MGD).

D. Analytical measurements
   1. The values of the turbidity, conductivity, pH, and temperature shall be monitored and logged.
   2. Each of these signals shall have operator entered high alarm set points.
   3. The temperature and pH signals shall also have low level alarm set points.
   4. On a high alarm of any of these signals the OIT shall email an alarm out to the operator.
   5. There shall be an enable/disable function on the OIT for these alarms.

E. Data Logging
   1. All data shall be logged to the OIT data storage device
   2. All data logging will be in a .CSV file format
   3. Flow values shall be recorded every 15 minutes
   4. All other values shall be recorded every 30 minutes
   5. All recorded data shall be stored for a minimum of 5 years

F. Remote Access
   1. Programming and equipment shall be provided as needed to allow the operator to access the OIT over a virtual private network (VPN).
   2. The operator shall then be able to view all the screens on the OIT and download the data stored there.
   3. Any routers needed for this shall be provided by the system integrator and setup and tested.
   4. This system shall be accessed through the internet connection available at the operator's residence.

END SECTION

Appendix C

CONSTRUCTION DRAWINGS

Kannah Creek Intake Rehabilitation Project

PROJECT NO. _____

2017 KANNAH CREEK INTAKE REHABILITATION SEPTEMBER, 2017

UTILITIES AND AGENCIES

AGENCY	NAME	POSITION	ROLE	MAILING ADDRESS	STREET ADDRESS	CITY, STATE	VOICE–WK	FAX
GRAND JUNCTION, CITY OF	JOHN EKLUND	PROJECT ENGINEER	PROJECT ENGINEER	250 N. 5th STREET	250 N. 5th STREET	GRAND JCT., CO 81501	(970) 244–1558	(970) 256–4022
GRAND JUNCTION, CITY OF	TRENT PRALL	ENGINEERING MANAGER	ENGINEERING MANAGER	250 N. 5th STREET	250 N. 5th STREET	GRAND JCT., CO 81501	(970) 256–4047	(970) 256–4022
GRAND JUNCTION, CITY OF	RICK BRIMKMAN	WATER SERVICES MANAGER	WATER	333 WEST AVENUE	333 WEST AVENUE	GRAND JCT., CO 81501	(970) 244–1429	
GRAND VALLEY POWER		UNIT MANAGER	GAS, ELECTRIC	845 22 RD	845 22 RD	GRAND JCT., CO 81505	(970) 242–0040	

City of Grand Junction Colorado

Public Works
Engineering Division

811 Know what's **below.** **Call** before you dig.

NOTE: NOTIFY AFFECTED UTILITY VENDOR 48 HOURS PRIOR TO EXCAVATIONS THAT WILL EXPOSE UTILITY LINES. THE COVER SHEET WILL HAVE A LISTING OF UTILITY VENDORS AND TELEPHONE NUMBERS.

DESCRIPTION	DATE
REVISION △	
REVISION △	
REVISION △	
REVISION △	

DRAWING STATUS:
- ○ PROGRESS
- ● BID SET
- ○ FINAL CONSTRUCTION DRAWINGS
- ○ ASBUILT

DESIGNED BY:
JOHN EKLUND, PROJECT ENGINEER 2017

REVIEWED BY:
TRENTON C. PRALL, ENGINEERING MANAGER 2017

AUTHORIZED FOR CONSTRUCTION
TRENTON C. PRALL, ENGINEERING MANAGER 2017

ACCEPTED AS CONSTRUCTED
JOHN EKLUND, PROJECT ENGINEER 2017

2017 KANNAH CREEK INTAKE REHABILITATION, SEPTEMBER, 2017, PLAN SET NO. ___

N:\Landproj\(Kannah Creek Intake)\dwg\Kannah Creek Intake Improvements.dwg, 01, 9/13/2017 9:00:48 AM

PROJECT NO. _____

ABBREVIATIONS

AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY & TRANSPORTATION OFFICIALS
ABC	AGGREGATE BASE COURSE
AC	ASBESTOS CEMENT
AP	ANGLE POINT
ASB	ANCHORED STRAW BALES
ASP	ALUMINIZED STEEL PIPE
ASTM	AMERICAN SOCIETY FOR TESTING MATERIALS
AWWA	AMERICAN WATER WORKS ASSOCIATION
BC	BACK OF CURB
BF	BUTTERFLY VALVE
BOW	BACK OF WALK
BCR	BEGIN CURB RETURN
BOT	BOTTOM
BSWMP	BETTER STORM WATER MANAGEMENT PRACTICES
CH	CHORD
CAP	CORRUGATED ALUMINUM PIPE
CDOT	COLORADO DEPARTMENT OF TRANSPORTATION
CI	CAST IRON
C,G,& SW	CURB, GUTTER & SIDEWALK
℄	CENTER LINE
CL	CLEAR
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
COMB	COMBINATION (AS IN STORM SEWER AND SANITARY SEWER)
CONC	CONCRETE
CSM	CITY SURVEY MONUMENT
CSP	CORRUGATED STEEL PIPE
CU	COPPER
DI	DUCTILE IRON
DWY	DRIVEWAY
E	ELECTRIC
ECR	END CURB RETURN
EG	EDGE OF GUTTER
EL	ELEVATION
EP	EDGE OF PAVEMENT
EX	EXISTING
FB	FULL BODY
FC	FACE OF CURB
FG	FINISHED GRADE
F	FLOW LINE
FL	FLANGE
FM	FORCE MAIN
FO	FIBER OPTICS
FS	FAR SIDE
FTG	FOOTING
G	GAS
GB	GRADE BREAK
GM	GAS METER
GV	GATE VALVE
HBP	HOT BITUMINOUS PAVEMENT
HDPE	HIGH DENSITY POLYETHYLENE
INV	INVERT
IRR	IRRIGATION
L	LENGTH OF ARC
LC	LONG CHORD
LF	LINEAR FEET
LL	LONG ARC
LS	SHORT ARC
LT	LEFT
MB	MAILBOX
MCSM	MESA COUNTY SURVEY MONUMENT
MH	MANHOLE
MJ	MECHANICAL JOINT
MW	MILL WRAP
N/A	NOT APPLICABLE
NIC	NOT IN CONTRACT
NOP	NO ONE PERSON
NRCP	NON-REINFORMATIONRCED CONCRETE PIPE
NS	NEAR SIDE
NTS	NOT TO SCALE
OHP	OVERHEAD POWER
OHT	OVERHEAD TELEPHONE
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PE	POLYETHYLENE
PERF	PERFORATED
PI	POINT OF INTERSECTION
PIP	PLASTIC IRRIGATION PIPE
POC	POINT ON CURVE
POT	POINT ON TANGENT
PR	PROPOSED
PRC	POINT OF REVERSE CURVATURE
PT	POINT OF TANGENCY
PVC	POLYVINYL CHLORIDE
R	RADIUS
RCP	REINFORMATIONRCED CONCRETE PIPE
REQ'D	REQUIRED
RG	RESTRAINED GLANDS
RL	LONG RADIUS
ROW	RIGHT OF WAY
RP	RADIUS POINT
RR	RAIL ROAD
RS	SHORT RADIUS
RT	RIGHT
S	SLOPE
SAN	SANITARY
SC	SHORT CHORD
SCD	STANDARD CONTRACT DOCUMENTS
SCH	SCHEDULE
SF	SILT FENCE
SL	SECTION LINE
SSRB	STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION
SSUU	STANDARD SPECIFICATIONS FOR CONSTRUCTION OF UNDERGROUND UTILITIES
STA	STATION
STL	STEEL
STM	STORM
T	TELEPHONE
TAN	LENGTH OF TANGENT
TC	TOP OF CURB
TH	TEST HOLE
TV	TELEVISION
(TYP)	TYPICAL
UU	UNDERGROUND UTILITIES
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
VPC	VERTICAL POINT OF CURVATURE
VPCC	VERTICAL POINT OF COMPOUND CURVATURE
VPRC	VERTICAL POINT OF REVERSE CURVATURE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
W	WATER
△	DELTA ANGLE

LEGEND

BSWMP DRAINAGE BASIN BOUNDARY

BSWMP ANCHORED STRAW BALES — ASB ASB ASB ASB ASB ASB ASB

BSWMP SILT FENCE — SF SF SF SF SF SF SF

BUILDING

CONCRETE CURB AND GUTTER — 2' CURB AND GUTTER

CONCRETE CURB,GUTTER, & SIDEWALK — 7' C, G, & SW

CONCRETE DITCH — CONCRETE

CONCRETE SIDEWALK — 4' SW

CULVERT — 18" RCP

EARTH DITCH — EARTH EARTH EARTH

EDGE OF GRAVEL

EDGE OF PAVEMENT

FENCE (BARBED WIRE)

FENCE (CHAIN LINK)

FENCE (IRON)

FENCE (PLASTIC)

FENCE (TEMPORARY CONSTRUCTION)

FENCE (WOOD)

FENCE (WOVEN WIRE)

GUARD RAIL

HATCHING: INDICATES ASPHALT REMOVAL

HATCHING: INDICATES CONCRETE REMOVAL

HATCHING: INDICATES STAGING AREA — ~STAGING AREA~

LINE (CENTER OF IMPROVEMENTS) — CENTERLINE

LINE (CITY LIMITS) — CITY LIMITS

LINE (CONTROL) — CONTROL LINE

LINE (EASEMENT)

LINE (MONUMENT/SECTION) — MONUMENT/SECTION LINE

LINE (PROPERTY)

LINE (RIGHT OF WAY)

MATCH LINE — MATCH LINE SEE SHEET NO ?

PIPE (IRRIGATION) — 4" IRR

PIPE (SIPHON) — 4" SIPHON

PROPOSED CONCRETE CURB AND GUTTER

PROPOSED CONCRETE CURB,GUTTER,& SIDEWALK

PROPOSED CONCRETE SIDEWALK

PROPOSED "WET" UTILITIES (CONSTRUCTION NOTE WILL INDICATE TYPE, SIZE, AND MATERIAL OF NEW MAIN) — 8" PVC SANITARY SEWER

ALL PROPOSED FEATURES NOT SHOWN IN LEGEND WILL BE SHOWN THE SAME AS THEIR EXISTING COUNTERPART, BUT INDICATED BY BOLDER LINETYPE

RAIL ROAD

RETAINING WALL — 1' RETAINING WALL

STRIPING (CONTINUOUS WHITE) — WHITE

STRIPING (DASHED WHITE) — WHITE

STRIPING (CONTINUOUS YELLOW) — YELLOW

STRIPING (DASHED YELLOW) — YELLOW

TOP OF SLOPE — 4580

CONTOUR LINES (SHOWN BETWEEN TOP & TOE)

TOE OF SLOPE — 4570

TRAFFIC DETECTOR LOOP

UTILITY LINE (ABANDON) (THIS CASE A WATER LINE) — W (ABANDON) 8" W

UTILITY LINE (CABLE TV) — TV TV

UTILITY LINE (ELECTRIC) — E E

UTILITY LINE (FIBER OPTIC) — FO QWEST FO

UTILITY LINE (GAS) — G 1 1/4" MIN G

UTILITY LINE (HIGH VOLTAGE OVERHEAD POWER) — HVOHP

UTILITY LINE (OVERHEAD POWER) — OHP

UTILITY LINE (OVERHEAD TELEPHONE) — OHT

UTILITY LINE (SANITARY SEWER) — 8" SAN

UTILITY LINE (SANITARY SEWER FORCE MAIN) — 6" FM

UTILITY LINE (SANITARY SEWER SERVICE) — SS

UTILITY LINE (STORM SEWER) — 8" STM

UTILITY LINE (STORM SEWER, PERFORATED) — 6" PERF

UTILITY LINE (STORM/SANITARY SEWER SEWER COMBINATION) — 18" COMB

UTILITY LINE (TELEPHONE) — T T

UTILITY LINE (WATER) — W 8" W

SYMBOLS

- BENCH MARK
- CATCH BASIN
- CLEAN OUT
- CURB STOP
- FIRE HYDRANT
- GUY WIRE ANCHOR
- HEADGATE
- IRRIGATION PUMP
- MAILBOX
- MANHOLE (ELECTRIC)
- MANHOLE (GAS)
- MANHOLE (SANITARY/STORM)
- MANHOLE (TELEPHONE)
- MANHOLE (TV)
- MANHOLE (WATER)
- METER (GAS)
- METER (WATER)
- PEDESTAL (TELEPHONE)
- PEDESTAL (TV)
- PROPERTY PIN
- PULL BOX
- REDUCER FITTING
- SIGN OR POST (SIGN TYPE NOTED) — STOP
- SPRINKLER HEAD
- STREET LIGHT
- SURVEY MONUMENT (CITY) — CSM
- SURVEY MONUMENT (TYPE NOTED) — MCSM
- TEST HOLE — TH #1
- TRAFFIC PAINT MARKING
- TRAFFIC SIGNAL POLE AND MAST ARM
- UTILITY POLE
- VALVE (GAS)
- VALVE (IRRIGATION)
- VALVE (WATER)
- VEGETATION (HEDGE OR BUSH)
- VEGETATION (TREE STUMP)
- VEGETATION (TREE) (CALIPER SIZE NOTED)
- WATER HYDRANT
- WEIR
- YARD LIGHT

BAR SCALE:

0 5 10 20

(IN FEET)
1 inch = 20 ft.

NORTH ARROW: N W E S

DESCRIPTION	DATE
REVISION 1	
REVISION 2	
REVISION 3	
REVISION 4	

DRAWN BY JCS DATE 4-02
DESIGNED BY _____ DATE _____
CHECKED BY _____ DATE _____
APPROVED BY _____ DATE _____

SCALES: PLAN & PROFILE
HORIZONTAL: 1" =
VERTICAL: 1" =

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

CITY OF GRAND JUNCTION
STANDARD ABBREVIATIONS, LEGEND, AND SYMBOLS

2

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PROJECT NO. _____

Bid Schedule: Kannah Creek Intake Rehabilitation

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
1	108.2	Irrigation Pipe (6") (SDR 35 PVC)	38.5	LF	$ _____	$ _____
2	108.2	Water Main (6") (C900, DR-18)	27.	LF	$ _____	$ _____
3	108.2	Water Main (8") (C900, DR-18)	34.	LF	$ _____	$ _____
4	108.2	Water Main (18") (C-905, DR-18) (Includes all Bell Joint Restraints and Connection to existing pipe)	282.	LF	$ _____	$ _____
5	108.2	Water Main (24") (C-905, DR-18) (Includes all Bell Joint Restraints and Connection to existing pipe and intake inlet)	237.		$ _____	$ _____
6	108.3	Check Valve (6") (Tideflex Checkmate Series 35 or Engineer approved equal)	2.	EA	$ _____	$ _____
7	108.3	Check Valve (8") (Tideflex Checkmate Series 35 or Engineer approved equal)	1.	EA	$ _____	$ _____
8	108.3	Combination Air Valve and Vault Assembly (6") (Includes Bedding material, flanged butterfly valve w/ 90o angle nut, air valve, 60" concrete vault, frost proof ring and cover, galvanized vent pipe, and all necessary fittings to complete assembly)	2.	EA	$ _____	$ _____
9	108.3	Elbow (2" x 90 deg)	14.	EA	$ _____	$ _____
10	108.3	Elbow (6" x 22.5 deg)	1.	EA	$ _____	$ _____
11	108.3	Elbow (6" x 90 deg)	2.	EA	$ _____	$ _____
12	108.3	Elbow (8" x 90 deg)	3.	EA	$ _____	$ _____
13	108.3	Elbow (18" x 22.5 deg)	1.	EA	$ _____	$ _____
14	108.3	Elbow (18" x 45 deg)	4.	EA	$ _____	$ _____
15	108.3	Elbow (24" x 11.25 deg)	2.	EA	$ _____	$ _____
16	108.3	Elbow (24" x 22.5 deg)	1.	EA	$ _____	$ _____
17	108.3	Electromagnetic Flow Sensor (8") (Spirax-Sarco MagFlow MAG 5100 W or Engineer approved equal) (Includes fittings to connect to waterline)	1.	EA	$ _____	$ _____
18	108.3	Electromagnetic Flow Sensor (18") (Spirax-Sarco MagFlow MAG 5100 W or Engineer approved equal) (Includes fittings to connect to waterline)	1.	EA	$ _____	$ _____
19	108.3	Gate Valve (6") (Manual)	1.	EA	$ _____	$ _____
20	108.3	Gate Valve (8") (Includes Actuator)	1.	EA	$ _____	$ _____
21	108.3	Slide Gate (24") (Whipps 800 Series or Engineering approved equivalent) (Includes modification of existing concrete structure to accommodate new gate and actuator)	2.	EA	$ _____	$ _____
22	108.3	Tee (18" x 6")	1.	EA	$ _____	$ _____
23	108.3	Tee (18" x 8")	1.	EA	$ _____	$ _____
24	108.4	Irrigation Connection (2") (Include connection to Irrigation pump, pump starter, well pump VFD)	Lump	Sum	---	$ _____
25	108.4	Irrigation Service Line (2") (Sch 40) (Include Elbows and Fittings to complete assembly and connect to Tapping Saddle and service line)	56.	LF	$ _____	$ _____
26	108.4	Water Service Line (2") (Sch 40) (Include Elbows and Fittings to complete assembly and connect to existing well and service line)	53.	LF	$ _____	$ _____
27	108.4	Water Treatment Connection (Includes Water meter, Expansion Tank, Filters, UV Filter, Water Softener, Potable Water System Pressure Transmitter) (Water service to house must remain in operation for the duration of the project)	Lump	Sum	---	$ _____
28	108.5	Pipe Valve Vault (60" I.D.) (8' Inside Height) (Inverted Ring/Cover) (Includes 6" thick Type A Bedding, adjustable pipe saddles (2) and all necessary fittings to complete assembly)	4.	EA	$ _____	$ _____
29	201	Clearing and Grubbing (Includes trees, bushes, and native vegetation)	0.27	AC	$ _____	$ _____
30	202	Abandon Pipe (Abandon pipe by plugging both ends with concrete)	1.	EA	$ _____	$ _____
31	202	Remove Building (Includes removal of concrete spillway and foundation wall to minimum 12" below finished grade)	Lump	Sum	---	$ _____
32	202	Remove Existing Air Valve	1.	EA	$ _____	$ _____
33	202	Remove Existing Pipe (Size as shown on plans)	350.	LF	$ _____	$ _____
34	202	Remove Sidewalk	6.44	SY	$ _____	$ _____
35	203	Embankment Fill (Complete-in-Place)	735.	CY	$ _____	$ _____
36	203	Rock Excavation (1 CY and larger)	75.	CY	$ _____	$ _____
37	207	Stripping and Stockpiling Topsoil	90.	CY	$ _____	$ _____
38	207	Topsoil	160.	CY	$ _____	$ _____
39	210	Modify Structure (Remove Steel bars from inlet opening)	Lump	Sum	---	$ _____
40	212	Seeding (Native)	0.3	AC	$ _____	$ _____
41	202	Seeding (Lawn)	0.02	AC	$ _____	$ _____
42	216	Soil Retention Blanket (Biodegradable Straw/Coconut)	725.	SY	$ _____	$ _____
43	304	Aggregate Base Coarse (Class 3) (Place in maximum 12" lifts compacted to 95% Standard Proctor)	70.	CY	$ _____	$ _____
44	506	Riprap Protection (6" D50 CDOT Gradation) Contractor shall use as much riprap from project trench excavation for rock protection where called out on the plans)	13.	CY	$ _____	$ _____
45	608	Concrete Sidewalk (4") (Includes 6" Class 6 Aggregate Base Coarse)	11.	SY	$ _____	$ _____
46	620	Sanitary Facility	Lump	Sum	---	$ _____
47	625	Construction Surveying	Lump	Sum	---	$ _____
48	626	Mobilization	Lump	Sum	---	$ _____
49	SP	Electrical & Control	Lump	Sum	---	$ _____
50	SP	FCA Modular Farmers Screen (Installation only)	Lump	Sum	---	$ _____
51	SP	Prefabricated Shed (10' x 12' Interior Dimensions) (Refer to Appendix _ for information) (Include 4" concrete foundation on 6" Class 6 Aggregate Base Coarse	Lump	Sum	---	$ _____
52		Dewater Inlet	Lump	Sum	---	$ _____
MCR		Minor Contract Revisions	---	---	---	$ 30,000.00

Bid Amount: $ _____

Bid Amount:

_____ **dollars**

DESCRIPTION	DATE
REVISION △	
REVISION △	
REVISION △	
REVISION △	

DRAWN BY HMC DATE 2017
DESIGNED BY JAE DATE 2017
CHECKED BY JAE DATE 2017
APPROVED BY _____ DATE _____

SCALES: PLAN & PROFILE
HORIZONTAL: 1" =
VERTICAL: 1" =

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

2017 KANNAH CREEK INTAKE REHABILITATION
SUMMARY OF APPROXIMATE QUANTITIES

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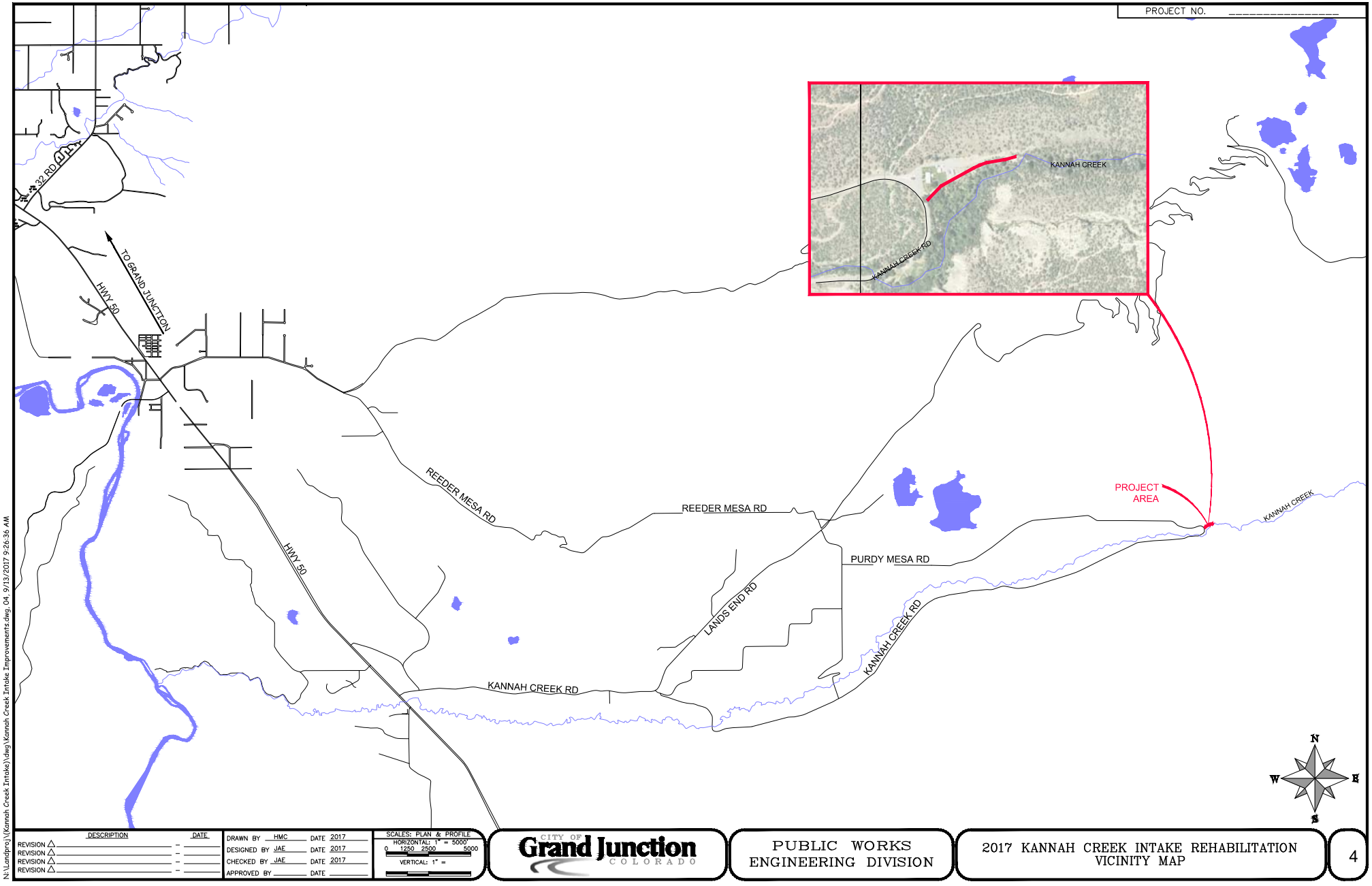

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REVISION △	

DRAWN BY HMC DATE 2017
DESIGNED BY JAE DATE 2017
CHECKED BY JAE DATE 2017
APPROVED BY DATE

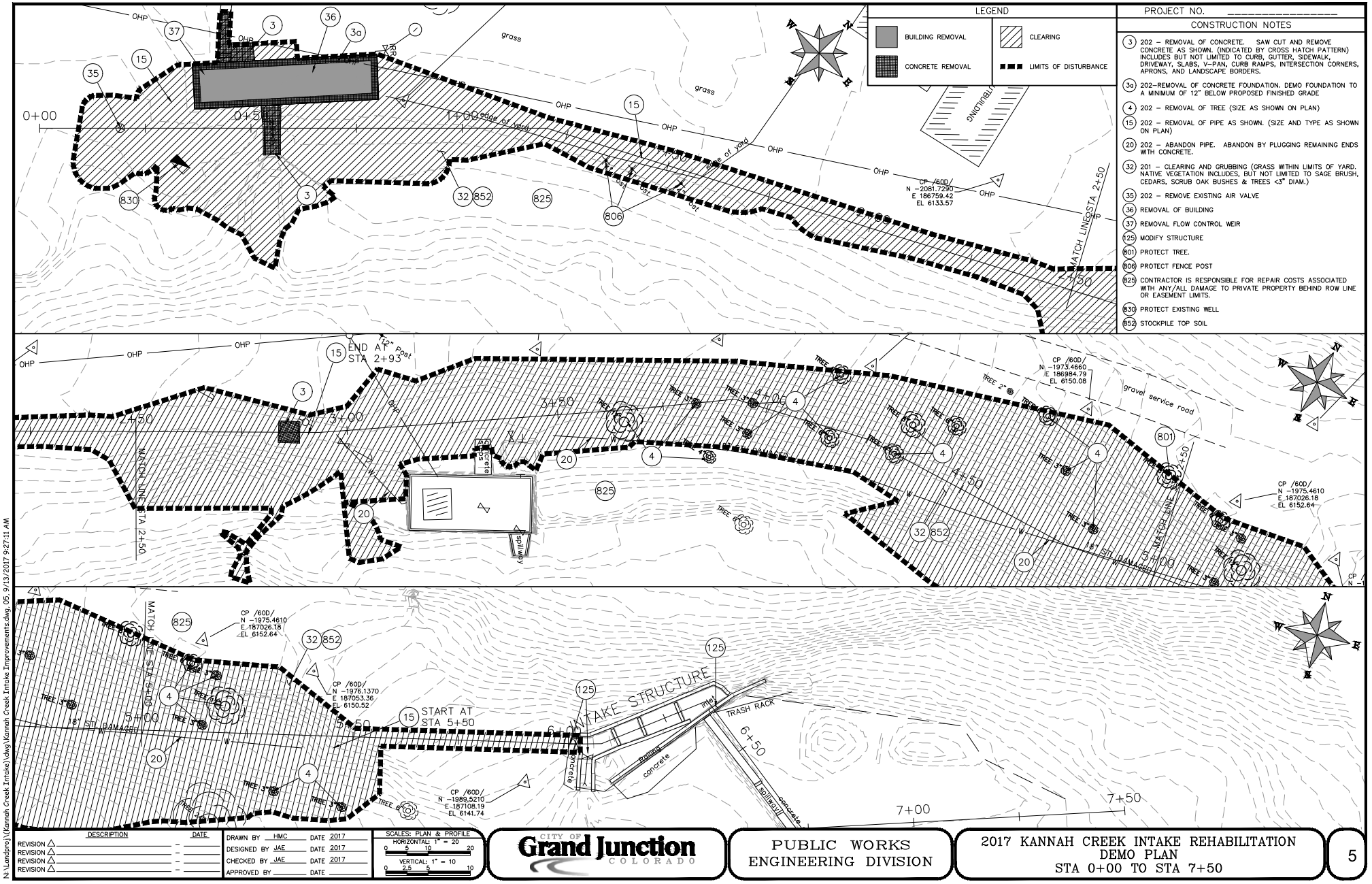
SCALES: PLAN & PROFILE
HORIZONTAL: 1" = 5000'
0 1250 2500 5000
VERTICAL: 1" =

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

2017 KANNAH CREEK INTAKE REHABILITATION
VICINITY MAP

4



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DRAWN BY HMC DATE 2017
DESIGNED BY JAE DATE 2017
CHECKED BY JAE DATE 2017
APPROVED BY DATE

SCALES: PLAN & PROFILE
HORIZONTAL: 1" = 20
VERTICAL: 1" = 10

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

2017 KANNAH CREEK INTAKE REHABILITATION
DEMO PLAN
STA 0+00 TO STA 7+50

5

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CONSTRUCTION NOTES

PROJECT NO. _____

555 608.06 – CONCRETE SIDEWALK (4" THICK)(INCLUDES 6" AGGREGATE BASE COURSE)

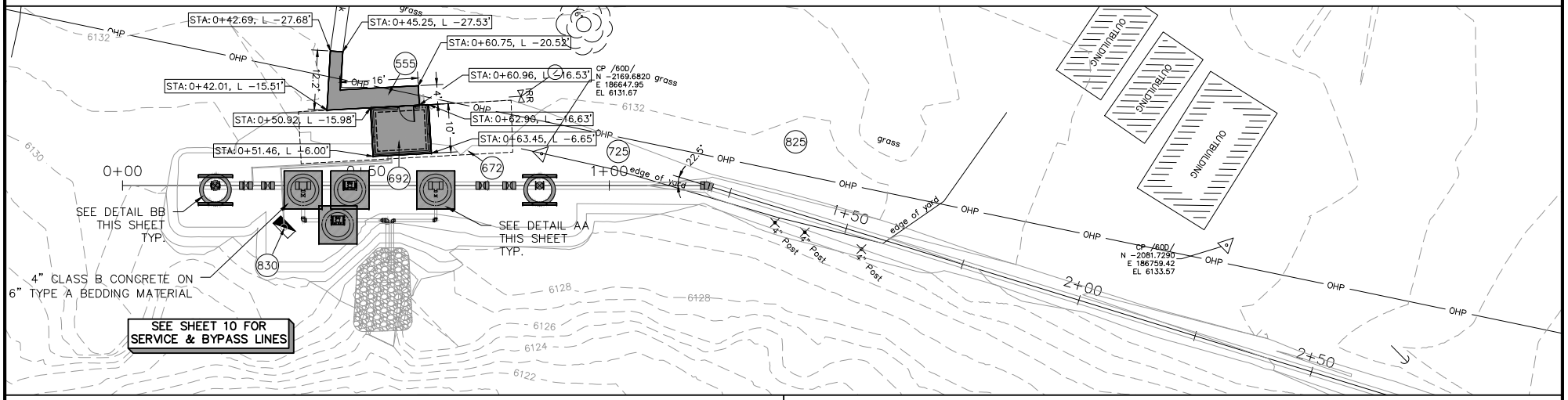
672 304–AGGREGATE BASE COURSE (CLASS 3)(FILL CONCRETE FOUNDATION TO DEPTH 6" BELOW FINISHED GRADE, OR TO PROPOSED CONTROL BUILDING FOUNDATION. FILL IN MAX 12" LIFTS COMPACTED TO 95% STANDARD PROCTOR)

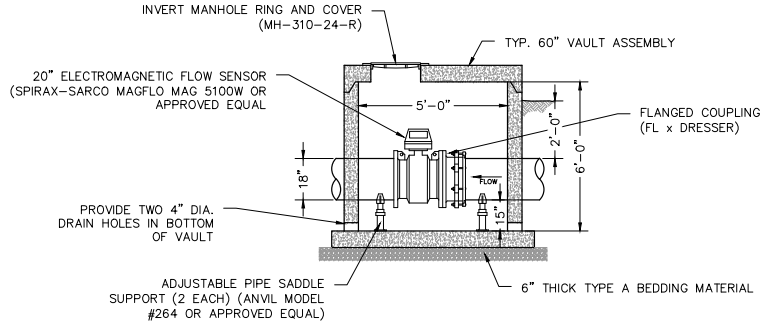
692 622–BUILDING FOUNDATION (4") (INCLUDES 6" AGGREGATE BASE COURSE)

725 207 – PLACE, GRADE, AND COMPACT 4" SUITABLE TOPSOIL AS SHOWN

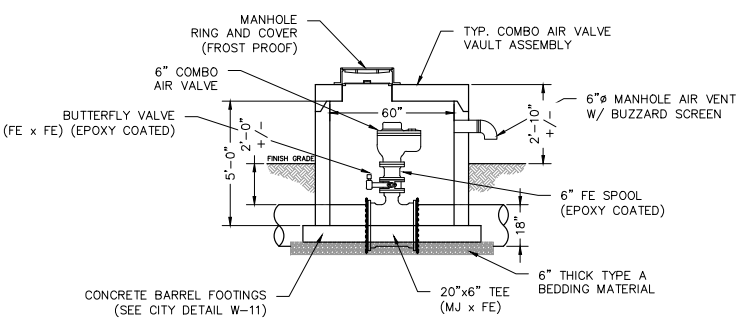
825 CONTRACTOR IS RESPONSIBLE FOR REPAIR COSTS ASSOCIATED WITH ANY/ALL DAMAGE TO PRIVATE PROPERTY BEHIND ROW LINE OR EASEMENT LIMITS.

830 PROTECT EXISTING WELL





DETAIL AA
EQUIPMENT VAULT DETAIL ASSEMBLY
N.T.S



DETAIL BB
COMBINATION AIR VALVE DETAIL ASSEMBLY
N.T.S.

NOTES:
– POSITION MANHOLE OPENING DIRECTLY OVER THE BUTTERFLY VALVE NUT FOR EASY OPERATION.

– 6" COMBINATION AIR VALVE AND VAULT ASSEMBLY (INCLUDES BEDDING MATERIAL, FLANGED BUTTERFLY VALVE WITH 90° ANGLE NUT, AIR VALVE, 60"ø CONCRETE VAULT, FROST PROOF RING AND COVER, GALVANIZED VENT PIPE, AND ALL NECESSARY FITTINGS TO COMPLETE AIR VALVE ASSEMBLY)

DESCRIPTION	DATE
REVISION △	
REVISION △	
REVISION △	
REVISION △	

DRAWN BY HMC DATE 2017
DESIGNED BY JAE DATE 2017
CHECKED BY JAE DATE 2017
APPROVED BY DATE

SCALES: PLAN & PROFILE
HORIZONTAL: 1" = 20
VERTICAL: 1" = 10

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

2017 KANNAH CREEK INTAKE REHABILITATION
CONCRETE PLAN
STA 0+00 TO STA 2+50

6

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CONSTRUCTION NOTES

PROJECT NO. _____

(33) SPECIAL PROVISION CURED IN PLACE

(358) 103 – CLAY CUT-OFF WALL (INCIDENTAL TO WATER INSTALLATION PAY ITEM)

(400) 102.7/108.2 – 18" WATER MAIN PIPE (SDR-18 PVC). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL OF TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.

(404) 102.8e/108.3 – BUTTERFLY VALVE (SIZE AS SHOWN) (SEE SHEET 10)

(409) 102.8/108.3 – 18", 45° ELBOW

(411) 102.8g/102.8h/108.3 – 6" AIR VALVE AND VAULT

(421) 102.8i/108.4 – METER SETTER (INSTALL ONLY) (SIZE AS SHOWN ON PLAN) (SEE SHEET 10)

(426) CONNECT TO EXISTING WATER PIPE/VALVE/FITTING. THE CONTRACT UNIT PRICE FOR WATER PIPE SHALL INCLUDE THE COST OF CONNECTION TO EXISTING PIPELINE

(432) 102.8/108.3 – 18" x 8" TEE

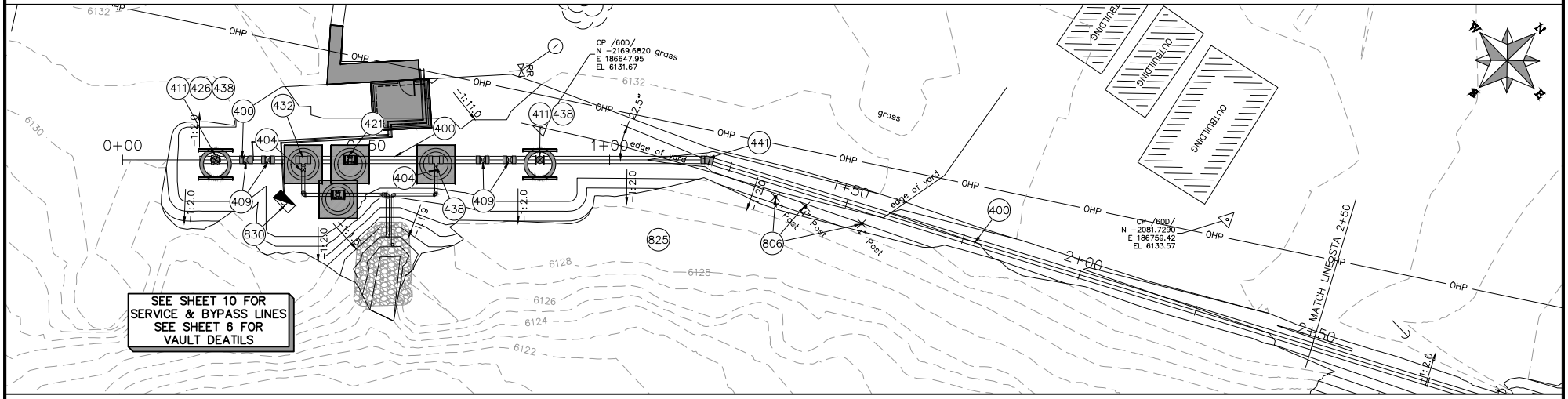
(438) 102.8/108.3 – 18" x 6" TEE

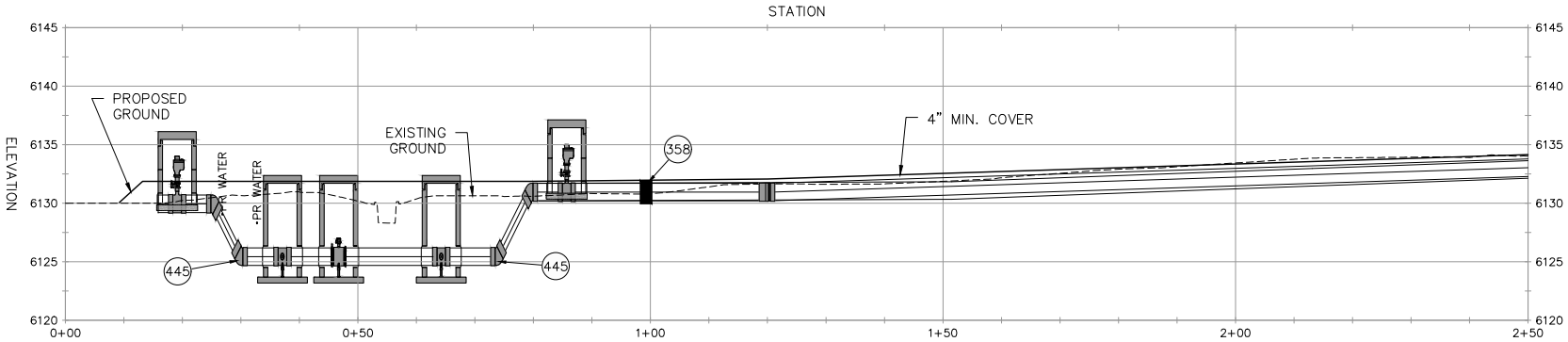
(441) 18", 22.5° ELBOW

(445) 102.8/108.3 18", 45° ELBOW

(825) CONTRACTOR IS RESPONSIBLE FOR REPAIR COSTS ASSOCIATED WITH ANY/ALL DAMAGE TO PRIVATE PROPERTY BEHIND ROW LINE OR EASEMENT LIMITS.

(830) PROTECT EXISTING WELL





DESCRIPTION	DATE
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DRAWN BY HMC DATE 2017
DESIGNED BY JAE DATE 2017
CHECKED BY JAE DATE 2017
APPROVED BY _____ DATE _____

SCALES: PLAN & PROFILE
HORIZONTAL: 1" = 20
VERTICAL: 1" = 10

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

2017 KANNAH CREEK INTAKE REHABILITATION
WATERLINE PLAN AND PROFILE
STA 0+00 TO STA 2+50

7

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CONSTRUCTION NOTES

PROJECT NO. _____

(34) FISHSCREEN INSTALLATION AND CONNECTION PER PROJECT SPECIFICATIONS

(241) 108.2 – 6" IRRIGATION PIPE (SDR 35 PVC).

(358) 103 – CLAY CUT–OFF WALL (INCIDENTAL TO WATER INSTALLATION PAY ITEM)

(400) 102.7/108.2 – 18" WATER MAIN PIPE (SDR–18 PVC). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL OF TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.

(401) 102.7/108.2 – 24" WATER MAIN PIPE (SDR–18 PVC). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL OF TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.

(442) 102.8/108.3 – 24", 22.5° ELBOW

(443) 102.8/108.3 – 24", 11.25° ELBOW

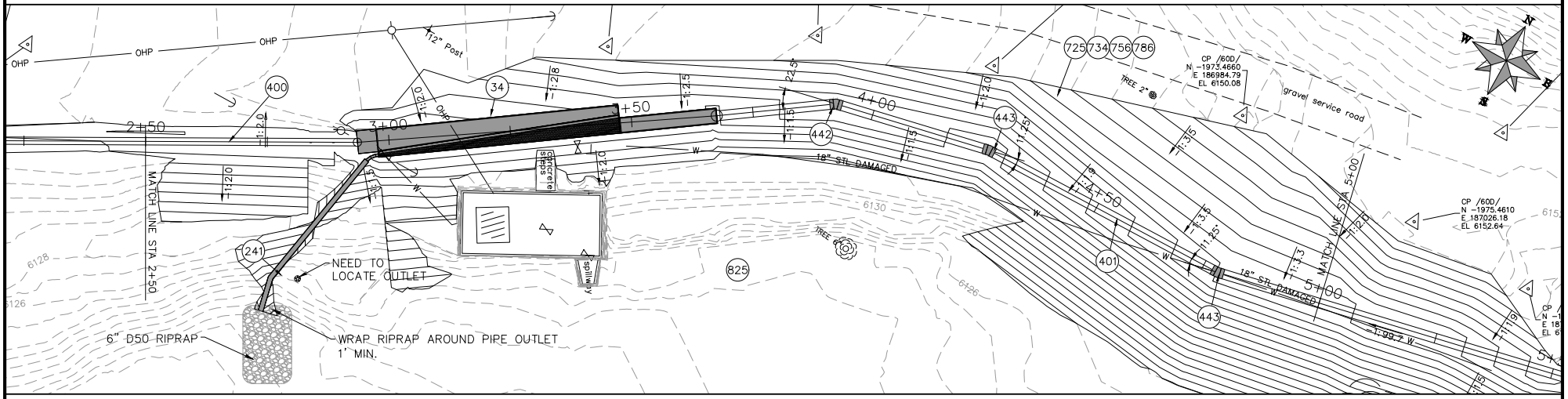
(725) 207 – PLACE, GRADE, AND COMPACT 4" SUITABLE TOPSOIL AS SHOWN

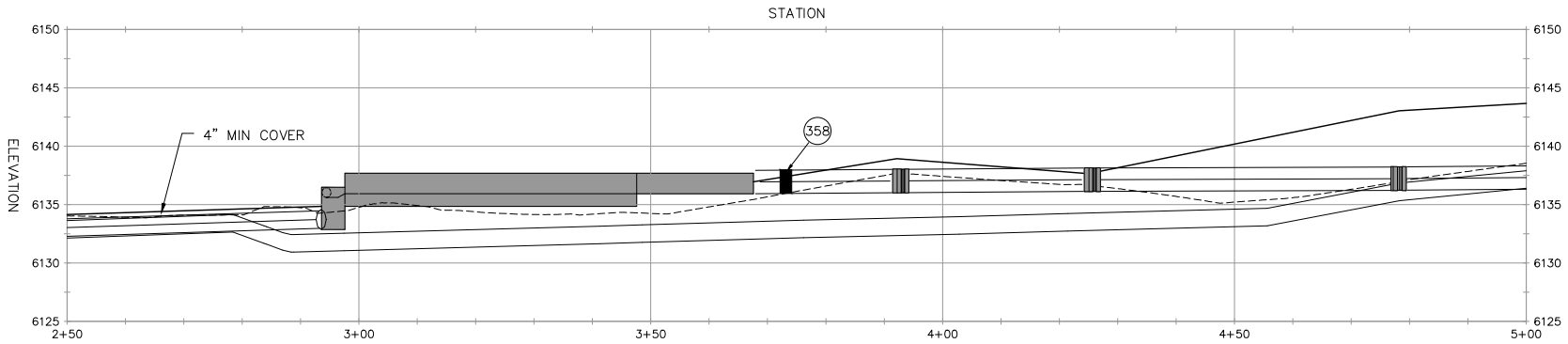
(734) 212 – SEED VARIATION (NATIVE MIX)

(756) 216 – SOIL RETENTION BLANKET (BIODEGRADABLE STRAW (COCONUT)

(786) 203 – EMBANKMENT FILL (COMPLETEION IN PLACE)

(825) CONTRACTOR IS RESPONSIBLE FOR REPAIR COSTS ASSOCIATED WITH ANY/ALL DAMAGE TO PRIVATE PROPERTY BEHIND ROW LINE OR EASEMENT LIMITS.





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DRAWN BY HMC DATE 2017
DESIGNED BY JAE DATE 2017
CHECKED BY JAE DATE 2017
APPROVED BY _____ DATE _____

SCALES: PLAN & PROFILE
HORIZONTAL: 1" = 20
0 5 10 20
VERTICAL: 1" = 10
0 2.5 5 10

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

2017 KANNAH CREEK INTAKE REHABILITATION
WATERLINE PLAN AND PROFILE
STA 2+50 TO STA 5+00

8

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CONSTRUCTION NOTES

PROJECT NO. _____

(126) REMOVE STEEL BARS FROM INLET

(358) 103 – CLAY CUT-OFF WALL (INCIDENTAL TO WATER INSTALLATION PAY ITEM)

(401) 102.7/108.2 – 24" WATER MAIN PIPE (SDR-18 PVC). INCLUDES TYPE A BEDDING AND HAUNCHING MATERIAL AND BACKFILL OF TRENCH WITH NATIVE MATERIALS MEETING 103.16 EARTH BACKFILL MATERIAL.

(450) 102.8/108.3 – WHIPPS 800 SERIES SLIDEGATE OR ENGINEER EQUIVALENT PER PROJECT SPECS

(725) 207 – PLACE, GRADE, AND COMPACT 4" SUITABLE TOPSOIL AS SHOWN

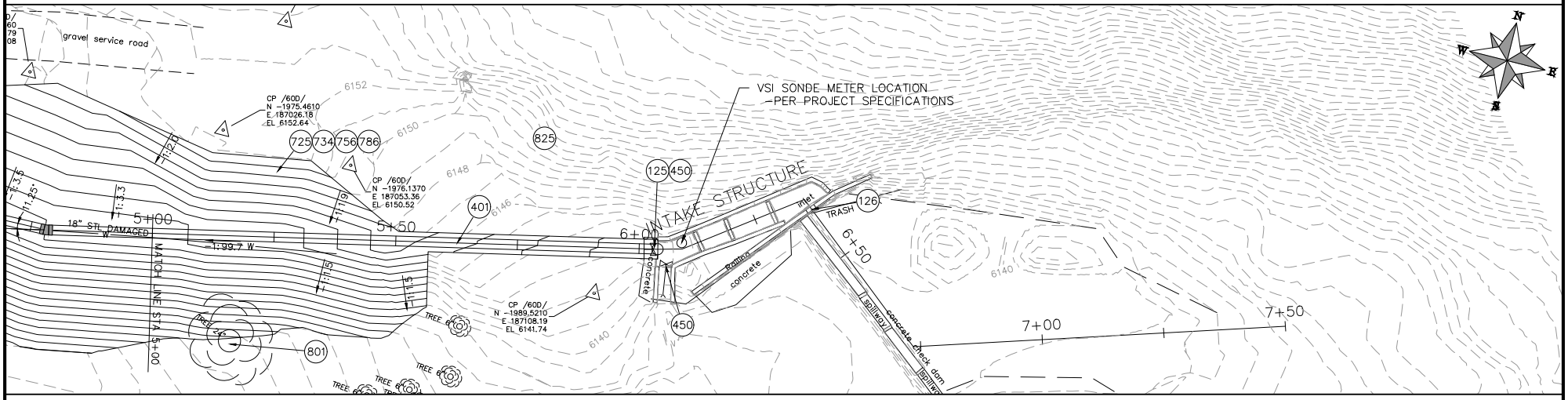
(734) 212 – SEED VARIATION (NATIVE MIX)

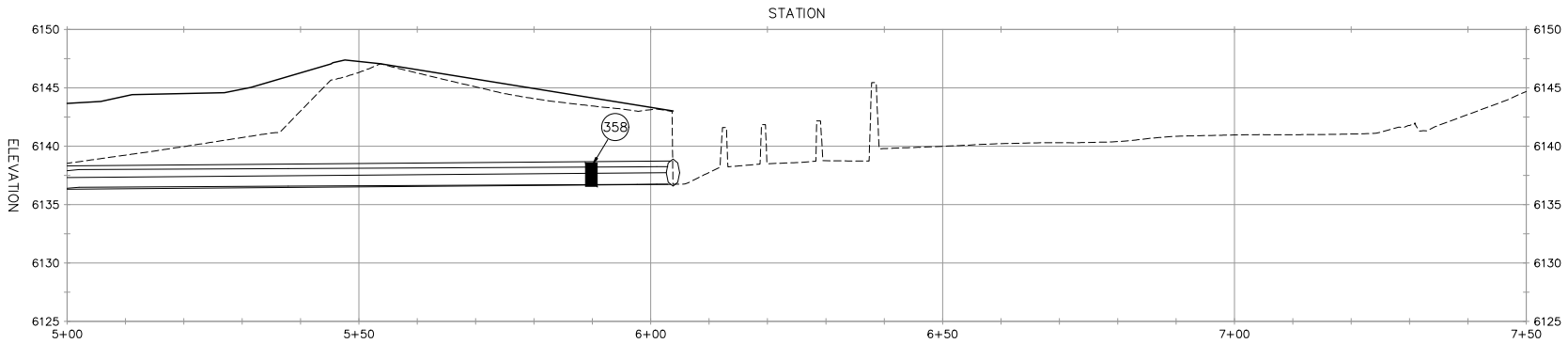
(756) 216 – SOIL RETENTION BLANKET (BIODEGRADABLE STRAW (COCONUT)

(786) 203 – EMBANKMENT FILL (COMPLETEION IN PLACE)

(801) PROTECT TREE.

(825) CONTRACTOR IS RESPONSIBLE FOR REPAIR COSTS ASSOCIATED WITH ANY/ALL DAMAGE TO PRIVATE PROPERTY BEHIND ROW LINE OR EASEMENT LIMITS.





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DRAWN BY HMC DATE 2017
DESIGNED BY JAE DATE 2017
CHECKED BY JAE DATE 2017
APPROVED BY _____ DATE _____

SCALES: PLAN & PROFILE
HORIZONTAL: 1" = 20
0 5 10 20
VERTICAL: 1" = 10
0 2.5 5 10

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

2017 KANNAH CREEK INTAKE REHABILITATION
WATERLINE PLAN AND PROFILE
STA 5+00TO STA 7+50

9

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CONSTRUCTION NOTES

PROJECT NO. _____

(415) 102.8k/108.4 – TAPPING SADDLE (18"x2")

(420) 102.8l/108.4 – METER SETTER (SIZE AS SHOWN ON PLAN)

(426) CONNECT TO EXISTING WATER PIPE/VALVE/FITTING. THE CONTRACT UNIT PRICE FOR WATER PIPE SHALL INCLUDE THE COST OF CONNECTION TO EXISTING PIPELINE

(439) 102.8/108.3 – 8", 90° ELBOW

(440) 102.8/108.3 – 6", 90° ELBOW

(451) 108.3 THRUSTBLOCK

(720) 207 – PLACE AND COMPACT FILL TO LEVEL EVEN with TOP OF FOUNDATION WALL

(725) 207 – PLACE, GRADE, AND COMPACT 4" SUITABLE TOPSOIL AS SHOWN

(730) 212 – RESEED AREA AS SHOWN

(734) 212 – SEED VARIATION 1

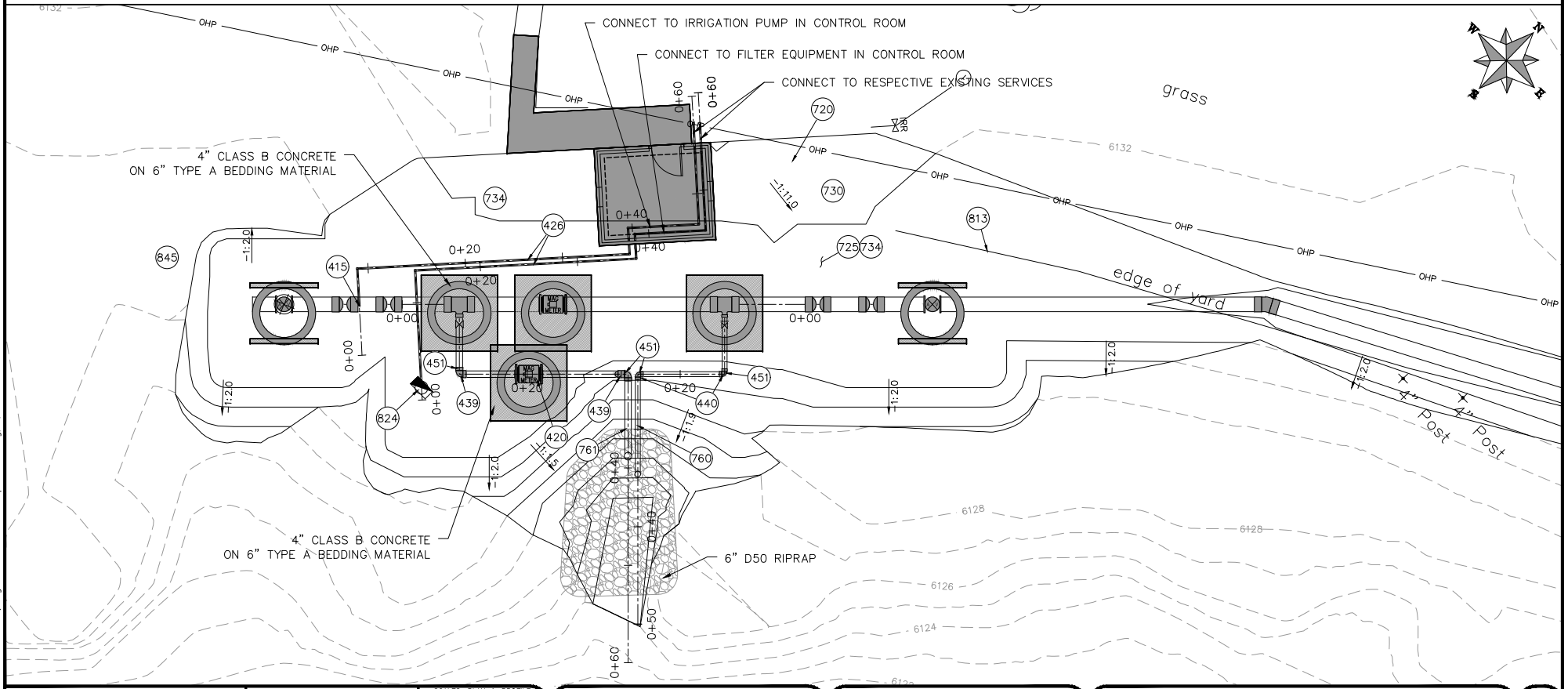
(760) 607 – 6" CHECK VALVE (TIDEFLEX CHECKMATE OR ENGINEER APPROVED EQUIVALENT)

(761) 607 – 8" CHECK VALVE (TIDEFLEX CHECKMATE OR ENGINEER APPROVED EQUIVALENT)

(813) PROTECT LANDSCAPE APPURTENANCE (TYPE AS SHOWN ON PLAN).

(824) PROTECT UTILITY PEDESTAL.

(845) NOTE: NOTIFY AFFECTED UTILITY VENDOR 48 HOURS PRIOR TO EXCAVATIONS THAT WILL EXPOSE UTILITY LINES. THE COVER SHEET WILL HAVE A LISTING OF UTILITY VENDORS AND TELEPHONE NUMBERS.



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VERTICAL: 1" = 10

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

2017 KANNAH CREEK INTAKE REHABILITATION
PLAN
OVERFLOW AND ADDITIONAL LINES

10

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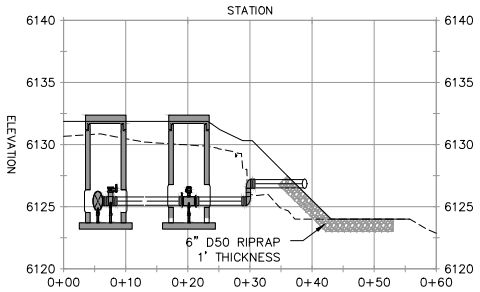
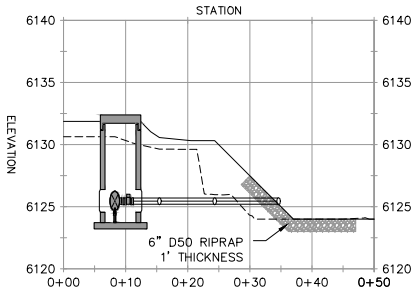
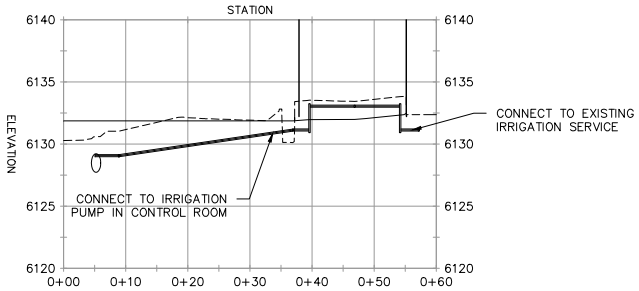
PROJECT NO. _____



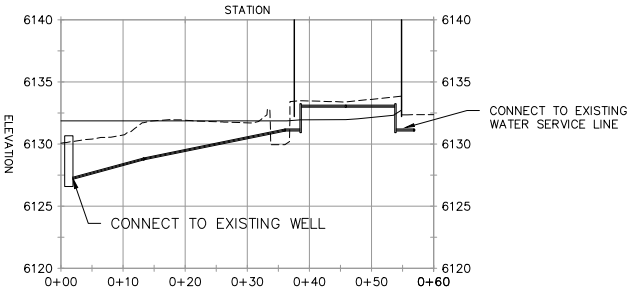
8IN OVERFLOW LINE



6IN OVERFLOW LINE



2IN IRRIGATION LINE



2IN WATER LINE

DESCRIPTION	DATE
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REVISION △	

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CHECKED BY JAE DATE 2017
APPROVED BY _____ DATE _____

SCALES: PLAN & PROFILE
HORIZONTAL: 1" = 20
0 5 10 20
VERTICAL: 1" = 10
0 2.5 5 10

CITY OF Grand Junction COLORADO

PUBLIC WORKS
ENGINEERING DIVISION

2017 KANNAH CREEK INTAKE REHABILITATION
PROFILES
OVERFLOW AND ADDITIONAL LINES

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