Purchasing Division

Invitation for Bid

IFB-4245-16-DH
Hallenbeck Reservoir #1 Downstream Slope Repair Project

Responses Due:

June 23, 2016 prior to 2:00pm

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, 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/Mesa County 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

Table of Contents

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 **Hallenbeck No. 1 Dam Modifications Project**. The Project generally consists of Clearing and Grubbing, 13,030 CY of Excavation, 28,879 CY of Embankment, abandoning existing piezometers, removing existing toe drain system, installing a new sand chimney filter and toe drain system, constructing a concrete retaining wall in the existing stream, installing new piezometers, re-establishing access roads along the dam, and reclamation work.

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

1.2. **Mandatory Pre-Bid Meeting:** **Prospective bidders are required to attend the mandatory pre-bid meeting. The meeting is on June 14, 2016 at 10:00am**. Meeting location will be in the City Council Auditorium, located at City Hall, 250 N. 5th Street, Grand Junction, CO. The purpose of this meeting 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 and/or Mesa County, Colorado and is referred to throughout this Solicitation. The term Owner means the Owner or his authorized representative.

1.4. **Prequalification Requirement: CITY ONLY** Contractors submitting bids over $50,000 must be pre-qualified in accordance with the City's *"Rules and Procedures for Pre-qualification of Contractors*". All bids received by the specified time will be opened, but the City will reject bids over $50,000 from contractors who have not been prequalified. Application forms for prequalification are available at the Administration Office of the Department of Public Works, City Hall, 250 North Fifth Street, Room 245. Call 970-256-4126 or 970-244-1555 for additional information. Contractors who are currently prequalified with the Colorado Department of Transportation (CDOT) will meet the requirements for prequalification by the City, unless the City has information or basis to the contrary. Due to the time required to process applications, *all applications must be submitted no later than two weeks prior to the Response Due Date*. Application link: http://www.gjcity.org/PreQualification.aspx

1.5. **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/BidOpenings.aspx 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**)

1.6. **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.

1.7. **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.

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

1.9. **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/BidOpenings.aspx.

1.10. **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.

The performance of the Work for this Project shall conform to the General Contract Conditions presented in the City of Grand Junction's Standard Contract Documents for Capital Improvements Construction, revised July 2010, except as specifically modified or supplemented herein or on the Construction Drawings.

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

1.12. 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.

1.13. 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.

1.14. 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/BidOpenings.aspx. 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.

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

1.16. 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.

1.17. 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.

1.18. 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.

1.19. 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.

1.20. 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 and/or Mesa County, 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: As soon as practicable after bids are received and prior to the award of the contract, the successful Contractor shall furnish 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. Offeors 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 Offeors: 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 City of Grand Junction is soliciting competitive bids from qualified and interested companies for all labor, equipment, and materials required for the Hallenbeck No. 1 Dam Modifications Project. The Project generally consists of Clearing and Grubbing, 13,030 CY of Excavation, 28,879 CY of Embankment, abandoning existing piezometers, removing existing toe drain system, installing a new sand chimney filter and toe drain system, constructing a concrete retaining wall in the existing stream, installing new piezometers, re-establishing access roads along the dam, and reclamation work.

NOTE: The descriptions of the pay items listed in the Price Bid Schedule for this Project may not agree with those listed in the Standard Specifications. Payment for all Work performed, as required in the Contract Documents, will be in accordance with the items and units listed in the Price Bid Schedule.

The performance of the Work for this Project shall conform to the General Contract Conditions presented in the City of Grand Junction's Standard Contract Documents for Capital Improvements Construction, revised July 2010, except as specifically modified or supplemented herein or on the Construction Drawings.

3.2. PROJECT DESCRIPTION: Hallenbeck No. 1 Dam is located in Mesa County, Colorado, about 21 miles southeast of Grand Junction, Colorado. The reservoir is used for water supply by the City of Grand Junction. The reservoir is an off-stream reservoir with inflows delivered from Juniata Reservoir, located immediately upstream from Hallenbeck No. 1 Dam.

The dam is a homogenous earthfill structure, and the facility includes a low-level outlet and a spillway. The high level outlet will be abandoned by the City of Grand Junction prior to the start of this project. The dam is classified as a high hazard structure by the Colorado State Engineer's Office (SEO).

The Project generally consists of Clearing and Grubbing, 13,030 CY of Excavation, 28,879 CY of Embankment, abandoning existing piezometers, removing existing toe drain system, installing a new sand chimney filter and toe drain system, constructing a concrete retaining wall in the existing stream, installing new piezometers, re-establishing access roads along the dam, and reclamation work.

3.3. SPECIAL CONDITIONS & PROVISIONS:

3.3.1 Mandatory Pre-Bid Meeting: **Prospective bidders are required to attend the mandatory pre-bid meeting. The meeting is on June 14, 2016 at 10:00am**. Meeting location will be in the City Council Auditorium, located at City Hall, 250 N. 5th Street, Grand Junction, CO. The purpose of this meeting will be to inspect and to clarify the contents of this Invitation for Bids (IFB).

For Bidders interested in touring the Hallenbeck No. 1 Reservoir site, a site visit will be made available on June 14th at 1:00 pm following the mandatory Pre-Bid meeting. This site visit is optional and not mandatory and is intended to help the Bidders gain a better understanding of the project site and answer any further questions.

The access road for the reservoir is located at the intersection of Lands End Road and Reeder Mesa Road. Turn right on the dirt road that is located at this intersection. It takes about 20-25 minutes from downtown Grand Junction to travel to the Hallenbeck reservoir.

3.3.2 QUESTIONS REGUARDING SOLICIATION 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 Lee Cooper, Project Engineer, who can be reached at (970)256-4155. 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 and Planning
Attn: Lee Cooper, Project Manager
250 North Fifth Street
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.

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

3.3.7 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.

3.3.8 Time of Completion: The scheduled time of Completion for the Project is 68 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.

3.3.9 Working Days and Hours: The working days and hours shall be as stated in the General Contract Conditions, Section VI or as mutually agreed upon in the preconstruction meeting.

3.3.10 Licenses and Permits: Contractor is responsible for obtaining all necessary licenses and permits required for Construction, at Contractors expense. See Section 2.12. Contractor shall supply to Owner all copies of finalized permits.

3.3.11 Permits: See Section 01410 – Regulatory Requirements. The following permits, if required for the Project, will be obtained by the City at no cost to the Contractor:

- United States Army Corps of Engineer's (USACE) Clean Water Act Section 404 Nationwide Permit and Clean Water Act Section 401 Water Quality Certification Authorization.

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

- Dewatering Permit
- Haul Permits

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

- AutoCAD drawings for survey stake-out.

3.3.13 Project Newsletters: Project newsletters, if required, will be the responsibility of the City.

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

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

3.3.16 Issuance of Notice of Award: Before the City of Grand Junction can issue Notice of Award for the project, the City needs to receive the signed and authorized loan documents from the Colorado Water and Conservation Board (CWCB). Once the City receives these signed loan documents, the City can issue Notice of Award. The City anticipates the Governor of Colorado will authorize and sign the loan documents by mid-July 2016.

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

3.3.18 Stormwater Management Plan: All vehicle and equipment maintenance and fueling shall be performed within the projects designated staging and material stockpile area. The fueling area shall exhibit Best Management Practices in order to minimize and/or eliminate the potential of fuel spillage. Any spillage of fuel onto the ground shall be immediately cleaned up and any contaminated soil disposed of properly at the Mesa County Landfill. Documentation of spills, leaks and overflows that result in the discharge of pollutants, including logging and reporting of the spill is required to the Water Quality Control Division at their toll-free 24-hour environmental emergency spill reporting line – 1-877-518-5608.

The Contractor shall clear the site of all on-site waste daily, including scrap from construction materials.

Concrete trucks will be required to wash out in a portable concrete washout pool supplied by the Contractor or the concrete truck shall wait to washout back at the concrete batching facility. The Contractor will be responsible for maintaining the concrete washout pool. The washout pool shall be cleaned out and/or replaced when the washout pool reaches 50% of total capacity.

The Contractor shall clear the site of all trash and litter daily. Portable toilets will be maintained (cleaned and emptied) by a local supplier.

3.3.19 Clean-Up: The Contractor shall clear the construction site of all trash and on-site waste daily, including scrap from construction materials.

3.3.20 Construction Equipment Storage: Staging and material stockpile areas shall coincide with the upper borrow area.

3.3.21 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.

3.3.22 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.

3.3.23 Weekly Progress Meetings: The Contractor and Engineer will schedule and hold regular progress meetings at least weekly and at other times as requested by the Engineer or the State Engineer's Office. The purpose of the meetings will be to review the progress of the work, maintain coordination efforts, discuss changes in schedule, and resolve issues that may develop.

3.3.24 STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION:

The ***City of Grand Junction Standard Specifications for Road and Bridge Construction*** are hereby modified or supplemented for this Project by the following modifications to ***The Standard Specifications for Road and Bridge Construction***, State Department of Highways, Division of Highways, State of Colorado:

None

3.3.25 STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER LINES, SANITARY SEWERS, STORM DRAINS, UNDERDRAINS AND IRRIGATION SYSTEMS

The City of Grand Junction ***Standard Specifications for Construction of Water Lines, Sanitary Sewers, Storm Drains, Underdrains and Irrigation Systems*** are hereby modified for this Project as follows:

None

3.4. SCOPE OF WORK: See attached Appendix B Technical Specifications.

3.5. IFB TENTATIVE TIME SCHEDULE:

Invitation For Bids available	May 27, 2016
Mandatory Pre-Bid Meeting	June 14, 2016
Inquiry deadline, no questions after this date	June 17, 2016
Addendum Posted	June 21, 2016
Submittal deadline for proposals	June 23, 2016
City Council or Board of Commissioners Approval	July 6, 2016
State Approval	TBD
Notice of Award & Contract execution	TBD
Bonding & Insurance Cert due	TBD
Preconstruction meeting	July 19, 2016
Work begins no later than	July 25, 2016
Final Completion	September 30, 2016
Holidays:	Labor Day – September 5, 2016

4. Contractor's Bid Form

Bid Date: _____

Project: IFB-4245-16-DH "Hallenbeck Reservoir #1 Downstream Slope Repair Project"

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.

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.

Bid Schedule: Hallenbeck No. 1 Dam Modifications Project

Item No.	CDOT, City Ref.	Description	Quantity	Units	Unit Price	Total Price
1	01505	Mobilization, Demobilization, and Preparatory Work	1.	Lump Sum	$ _____	$ _____
2	02240	Dewatering	1.	Lump Sum	$ _____	$ _____
3	02220	Selective Demolition	1.	Lump Sum	$ _____	$ _____
4	02280	Abandon Piezometers	1.	Lump Sum	$ _____	$ _____
5	01570	Sediment and Erosion Control	1.	Lump Sum	$ _____	$ _____
6	02235	Stripping and Stockpiling Topsoil	1,870.	Cu. Yd.	$ _____	$ _____
7	02315	Unclassified Excavation	11,160.	Cu. Yd.	$ _____	$ _____
8	02330	Embankment Fill (Complete-In-Place)	28,880.	Cu. Yd.	$ _____	$ _____
9	02330	Aggregate Base Course	260.	Cu. Yd.	$ _____	$ _____
10	02330	Filter Sand	4,820.	Cu. Yd.	$ _____	$ _____
11	02620	Toe Drain	915.	Lin. Ft.	$ _____	$ _____
12	02370	Riprap Bedding	300.	Cu. Yd.	$ _____	$ _____
13	02370	Riprap	1,200.	Cu. Yd.	$ _____	$ _____
14	03300	Retaining Wall Concrete	36.	Cu. Yd.	$ _____	$ _____
15	05520	Handrail	1.	Lump Sum	$ _____	$ _____
16	13500	Piezometers	371.	Lin. Ft.	$ _____	$ _____
17	02235	Topsoil Placement	1,870.	Cu. Yd.	$ _____	$ _____
18	02920	Seeding and Reclamation	8.	Acre	$ _____	$ _____
MCR		Minor Contract Revisions	- - -	- - -	- - -	$ 75,000.00

Bid Amount: **$** _____

Bid Amount:

_____ **dollars**

Contractor Name: _____

Contractor Address: _____

Contractor Phone #: _____

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 Submittals

PROJECT SUBMITTAL FORM

PROJECT: **Hallenbeck No. 1 Dam Modifications Project**

CONTRACTOR:

PROJECT ENGINEER: Lee Cooper

Description	Date Received	Resubmittal Requested	Resubmittal Received	Date Accepted
DAM CONSTRUCTION SUBMITTALS				
PIEZOMETER CONSTRUCTION SUBMITTALS				
EROSION CONTROL/STORMWATER MANAGEMENT				
PERMITS, PLANS, OTHER				
Hourly Labor and Equipment Rate Tables				

APPENDIX B

Technical Specifications

Hallenbeck No. 1 Dam Modifications Project

100% FINAL

TECHNICAL SPECIFICATIONS

HALLENBECK NO. 1 DAM MODIFICATIONS PROJECT

MESA COUNTY, COLORADO

DAM ID 420125
WATER DIVISION 4
WATER DISTRICT 42
SEO FILE C-0356F

Prepared for
City of Grand Junction
250 North 5th St.
Grand Junction, CO 81501

April 8, 2016

Prepared By:

AECOM, Inc.
8181 East Tufts Avenue
Denver, Colorado 80237

Project No. 60422760

100% FINAL

TECHNICAL SPECIFICATIONS

HALLENBECK NO. 1 DAM MODIFICATIONS PROJECT

MESA COUNTY, COLORADO

DAM ID 420125
WATER DIVISION 4
WATER DISTRICT 42
SEO FILE C-0356F

Engineer

I, Christina Julia Winckler hereby state that I am a Professional Engineer licensed in the state of Colorado, qualified in civil engineering; that the accompanying specifications for the Hallenbeck No. 1 Dam Modifications Project were prepared by me or under my supervision; that the accompanying specifications are in compliance with the Rules and Regulations for Dam Safety and Dam Construction (C-CCR 402-1); and that the same are true and correct to the best of my knowledge and belief.

Christina Julia Winckler, License Number 45480

Date: 5/11/2016

State Engineer

Approved on the 16th *day of* May, *20* 16.

Dick Wolfe, State Engineer

By: _____

William T. McCormick III, P.E., Colorado P.E. # 29127
Chief, Colorado Dam Safety Branch

TECHNICAL SPECIFICATIONS
TABLE OF CONTENTS
Hallenbeck No. 1 Dam Modifications

DIVISION 0 – BIDDING AND CONTRACTING REQUIREMENTS

Provided by the City of Grand Junction

DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 2 - SITE WORK

DIVISION 0 – BIDDING AND CONTRACTING REQUIREMENTS

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01110
SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project background, description, work summary, and work by Owner.

1.2 PROJECT BACKGROUND

A. Hallenbeck No. 1 Dam is located in Mesa County, Colorado, about 21 miles southeast of Grand Junction, Colorado**.** The reservoir is used for water supply by the City of Grand Junction (City). The reservoir is an off-stream reservoir with inflows delivered from Juanita Reservoir, located immediately upstream from Hallenbeck No. 1 Dam.

B. The dam is a homogenous earthfill structure, and the facility includes a low-level outlet, a high-level outlet, and a spillway. The dam is classified as a high hazard structure by the Colorado State Engineer's office (SEO).

1.3 PROJECT SUMMARY

A. The primary purpose of the project is to place a chimney filter with toe drain system and buttress on the downstream slope to protect against unfiltered seepage exits.

B. Major work items associated with the Project include:

1. Mobilization.
2. Diversion and dewatering.
3. Erosion and sediment controls.
4. Clearing and grubbing.
5. Stripping and stockpiling.
6. Developing borrow area.
7. Abandoning existing piezometers, toe drains and surface monument points.
8. Re-grading a portion of the upstream slope and placing riprap and drain gravel bedding.
9. Stripping and re-grading the downstream slope.
10. Removing existing toe drain systems.
11. Placing a filter diaphragm around the low-level outlet pipe near the right groin.
12. Placing chimney filter, toe drain system, and buttress on downstream slope.
13. Constructing a retaining wall in existing stream near maximum dam section.
14. Installing new piezometers.
15. Re-establishing access roads on left and right groin to crest.
16. Reclamation.
17. Demobilization.

1.4 WORK BY OWNER

A. Repairing Cone Valve and placing manhole cover on low-level outlet works. Manhole will need to be raised as part of this work. Owner to provide specifics on manhole to be used.

B. Relocating buried 4-inch and 6-inch water lines and electric line outside the construction footprint.

C. Abandoning high-level outlet works.

D. Furnish and place road base on service roads in left and right groins.

1.5 OWNER OCCUPANCY

A. Cooperate with Owner to minimize conflicts and to facilitate Owner's operations.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01120
CONTRACTOR WORK PLAN

PART 1 GENERAL

1.1 SUMMARY

A. This section covers the Contractor Work Plan.

1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Prepare and submit a project-specific Work Plan to the Engineer for approval within 14 days after Award. Include the following topics in the Work Plan:

1. Construction implementation plan to include work approach, equipment to be used for each item of construction, methods, and management.
2. Key personnel names and qualifications, list of subcontractors, including an organizational chart and project directory with contact information.
3. Health and Safety Plan. See Section 01145: Safety and Health.
4. Environmental Protection. See Section 01350: Environmental Protection.
5. Waste Handling and Disposal Procedures. See Section 01575: Disposal of Waste Materials.
6. Spill prevention and control procedures. See Section 01350: Environmental Protection.
7. Fire prevention and protection. See Section 01350: Environmental Protection.
8. Dust control. See Section 01350: Environmental Protection. (Best Management Practices (BMPs) to be used).
9. Construction sequence and schedule. See Section 01320: Construction Progress Schedule.
10. Construction Quality Control Plan (CQCP). See Section 01450: Quality Control.
11. Other applicable items to describe work approach.

1.3 WORK PLAN REQUIREMENTS

A. Develop the Work Plan in accordance with the requirements of the individual Sections listed above and any additional requirements in this Section. The Work Plan shall be prepared per these specifications, prepared in accordance with all applicable Federal, state, and local laws and regulations, and applicable engineering and construction practices. Include in the Work Plan a complete discussion of conformance with applicable laws, regulations, guidelines, and other applicable procedures.

B. Incomplete Plans or Plans without sufficient detail will be rejected and revisions required until the Plan is acceptable. The Plan must be approved by the Engineer before beginning field activities.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01145
HEALTH AND SAFETY

PART 1 GENERAL

1.1 SUMMARY

A. This section covers the requirements for health, safety, and emergency response for the project including submitting a written Site Health and Safety Plan (HSP) which at a minimum meets the General Conditions and the requirements of this Section, and complies with applicable Federal, state, and local laws and regulations.

B. It is the Contractor's responsibility to provide all facilities, equipment, materials, and personnel necessary to protect Contractor and other project personnel from physical injury and potential adverse health effects due to exposure to chemical, physical, weather, and other hazardous exposures while performing the Work.

1.2 REFERENCES

A. Occupational Safety and Health Administration (OSHA), 29 Code of Federal Regulations (CFR) 1910, General Industry Safety and Health Standards.

B. OSHA, 29 CFR 1926, Construction Industry Safety and Health Standards.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Submit the HSP to the Engineer for information only before any construction is initiated.

1.4 HEALTH AND SAFETY PLAN REQUIREMENTS

A. Develop the HSP to identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to minimize or eliminate each hazard. Develop a job specific activity hazard analysis to address the activity being performed, sequence of work, and hazards to be controlled in each activity.

B. Specifically address in the HSP activities that have the potential for personnel being exposed to chemical, dust, and noise hazards. Establish specific requirements and procedures activities that identify and monitor employee exposures, describe personal protective equipment use necessary to eliminate potential exposures, describe additional training on specific chemical hazards, and identify record keeping requirements for personnel monitoring data.

C. HSP Administrative Section:

1. Administrative responsibilities for implementing the HSP (project organization identifying Contractor personnel responsible for accident prevention).
2. Local requirements, if any (e.g., noise control, traffic ordinances, etc.).
3. Methods the Contractor proposes to use to control and coordinate subcontractor work.
4. Safety Meetings.
5. Plans for initial indoctrination, continued safety education, and training.

6. Safety Inspections.
7. Health and safety monitoring requirements.
8. Emergency response procedures and contingency plans, including fire protection, ambulance service, first aid, communication, etc.
9. Incident reporting and investigations.
10. Record keeping.
11. Other applicable/required health and safety procedures.

D. HSP Activity Hazard Analysis Section (AHA):

1. At a minimum address the following:

a. Mobilizing.
b. Transporting tools, heavy equipment, and materials to the site.
c. Clearing and grubbing.
d. Dewatering and diversion.
e. Excavation, including shoring, earthwork, and blasting.
f. Heavy equipment operation.
g. Project feature construction including structures, vaults, pipes, gates, and valves.
h. Electrical power connections and hook-ups.
i. Disposal of waste materials.
j. Traffic control.
k. Site reclamation.
l. Demobilization from site

E. Incident Reporting Section:

1. Include an incident reporting section that includes procedures for notifying appropriate parties with the Owner and Engineer immediately following an incident, and procedures and requirements for providing the Owner and Engineer with at least a preliminary written report within twenty four hours.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01200
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 DESCRIPTION

A. Measurement and payment criteria applicable to work performed under a unit price payment method.

B. Measurement and payment criteria applicable to work performed under a lump sum payment method.

C. List of unit price and lump sum pay items.

D. Schedule of value requirements for lump sum pay items.

1.2 AUTHORITY

A. Measurement methods delineated in the individual Specification Sections are intended to complement the criteria of this Section. In the event of conflict, the requirements of the individual Specification Section shall govern.

B. Take measurements and compute quantities for unit price pay items. The Engineer will verify measurements and quantities of work performed by the Contractor for payment purposes.

C. Assist the Engineer in the taking of measurements by providing necessary equipment, workers, and survey personnel as required.

1.3 NON-PAYMENT FOR REJECTED PRODUCTS

A. Payment will not be made for certain items, including but not limited to:

1. Products that are wasted or disposed of, or otherwise handled in a manner that is not acceptable.
2. Products determined to be unacceptable in the opinion of the Engineer, before or after placement.
3. Concrete that is delivered without a batch ticket or a ticket that does not show actual batch weights aggregate absorption, and aggregate moisture content.
4. Excavation or fill made for the convenience of the Contractor.
5. Over-excavation and backfill of over-excavation not approved by the Engineer.

1.4 QUANTITIES OF UNIT PRICE ITEMS

A. Quantities indicated in the Bid Form are for bidding and contract purposes only.

1.5 MEASUREMENT OF QUANTITIES FOR UNIT PRICE ITEMS

A. Measurement Devices:

1. Weigh scales: inspected, tested, and certified by the applicable State Department of Agricultural Weights and Measures Department within the past year.
2. Platform scales: of sufficient size and capacity to accommodate the conveying vehicle.

3. Metering devices: inspected, tested, and certified by the applicable State Department of Agricultural Weights and Measures Department within the past year.

1.6 MEASUREMENT BY VOLUME:

A. Measured by cubic dimension using mean length, width, and height or thickness.

B. Excavation quantities will be based on the calculated volume between the baseline survey, as defined in Section 01720: Layout of Work and Surveying and the excavation limits shown on the Drawings, or to the most practicable lines, grades and dimensions as prescribed by the Engineer , and will include only material that is actually removed within the prescribed pay lines.

C. Fill quantities will be based on the calculated volume between the excavation limits or the approved base surface and the fill limits shown on the Drawings, or to the most practicable lines, grades and dimensions as prescribed by the Engineer, and will include only material that is actually placed within the pay lines.

D. Compute embankment excavation and fill quantities in accordance with the requirements of Section 01720: Layout of Work and Surveying.

E. Where concrete for structures is to be placed directly upon or against the excavations and the character of the material cut into is such that the material cannot be trimmed efficiently to accurate dimensions by blasting, as determined by the Engineer, measurement for payment thereof will be made to the prescribed average dimension lines. The prescribed average dimension lines shall not exceed 6 inches outside the neat lines of the concrete for the purposes of measurement, for payment.

F. Measurement, for payment, of excavations upon or against which concrete is not required to be placed will be limited to the neat lines shown on the Drawings, or to the most practicable lines, grades, and dimensions as established by the Engineer.

1.7 MEASUREMENT BY AREA:

A. Measured by square dimension using mean length and width or radius. Items which are measured by the acre, such as revegetation, shall be measured horizontally.

1.8 LINEAR MEASUREMENT:

A. Measured by linear dimension, at the item centerline or mean chord. Items which are measured by the lineal foot, such as pipes, fence, etc., shall be measured parallel to the base or foundations upon which the items are placed, unless otherwise specified or shown on the Drawings.

1.9 STIPULATED SUM/PRICE MEASUREMENT:

A. Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed items or units of the Work.

1.10 LUMP SUM ITEMS

1. Lump sum items shall not be measured for payment. However, measurements may be made to monitor work progress for payment.

1.11 PAYMENT

A. Payment includes: Full compensation for furnishing the required labor, materials, products, tools, equipment, plant, transportation, services, incidentals, erection, application or installation of an item of the work, overhead and profit., and other costs of whatsoever nature for the items of work complete, will be included in the various bid items.

B. Contractor shall submit a Schedule of Values for the lump sum bid items listed in the Bid Schedule within 30 days of the Notice to Proceed. The Schedule of Values is intended to help the Engineer assess the intermediate value of work completed for the purpose of making progress payments

C. Payment for lump sum price items will be made on the basis of the contract lump sum prices in the Bid Form. If the Contractor requests progress payments for lump sum items, such progress payments will be made in accordance with a detailed program of payment apportioning in the schedule of values that, at a minimum, includes the various subdivisions identified in each lump sum bid item in the Description of Bid Items.

1.12 DEFINITION OF BID ITEMS

A. The intent of this Section is to explain, in general, what is and what is not included in a bid item, and the limits or cut off points where one bid item ends and another begins. If no bid item exists for a portion of the work, include the costs in a related bid item.

1. Mobilization, Demobilization, and Preparatory Work

a. This item includes mobilization of the Contractor and subcontractor personnel, equipment, and temporary construction facilities to the project site per Section 01505: Mobilization and Preparatory Work.

b. The cost of the work specified in Division 1 - General Requirements, unless specifically covered in other bid items, will not be paid separately, but shall be included in the lump sum price bid in the schedule of values for Mobilization, Demobilization, and Preparatory Work.

c. Payment will be made as follows, subject to acceptable construction progress and indicated above:

1) Thirty percent of the bid item price for this item with the first monthly pay application.

2) Fifteen percent of the bid item price for this item with the second monthly pay application.

3) The remainder equally prorated over each remaining payment request for the balance of the project.

d. Mobilization, Demobilization, and Preparatory work are limited to maximum of 10 percent of the total extended base bid price.

2. Dewatering (Lump Sum Item)

a. This item includes dewatering all construction areas including installing, maintaining and removing all pumps, piping, drains, well points, wells, and other facilities required to effectively control, collect, and dispose of groundwater or surface water to permit safe and proper construction of

all contract work. This item also includes removing the dewatering facilities at the end of construction.

b. Measurement: Measurement will be based on the approved Schedule of Values.

c. Payment: Payment will be made at the Contract Lump Sum Price.

3. Selective Demolition (Lump Sum Item)

a. This item includes demolishing and removing portions of existing features to the extents shown on the Drawings and as specified in Section 02220: Selective Demolition, protecting existing structures to remain, and hauling and legally disposing of demolished materials at an approved offsite disposal facility.

b. Measurement: Measurement will be based on the approved schedule of values.

c. Payment: Payment will be made at the Contract Lump Sum Price.

4. Abandon Piezometers (Lump Sum Item)

a. This item includes all work associated with abandoning piezometers designated on the Drawings for abandonment.

b. Measurement: Measurement shall be based on the approved Schedule of Values.

c. Payment: Payment will be made at the Contract Lump Sum Price.

5. Erosion and Sediment Control (Lump Sum Item)

a. This item includes installation, maintenance, and removal of new sediment control devices for the Work, including hay bales, silt fence, stormwater conduits, drains, sedimentation ponds, and associated environmental compliance work shown on the Drawings or required by Federal, State, and County permits. Item also includes coordinating new erosion and control facilities with existing erosion and sediment control facilities. This item also includes preparation, implementation, and maintenance of a Stormwater Pollution Prevention Plan (SWPPP) for the project.

b. Measurement: Measurement will be based on the approved schedule of values.

c. Payment: Payment will be made at the contract lump sum price.

6. Stripping and Stockpiling Topsoil (Unit Price Item)

a. This item includes stripping all topsoil as defined in the Specifications to the depths approved by the Engineer and within the limits of disturbed areas approved by the Engineer. Item includes hauling the stripped topsoil to the stockpile area and stockpiling the topsoil. Re-location of the stockpiled topsoil to a new stockpile location is considered a Contractor convenience and will not be paid for separately.

b. Measurement: Measurement will be in cubic yards of topsoil in the stockpile.

c. Payment will be made at the Contract Unit Price per cubic yard.

7. Unclassified Excavation (Unit Price Item)

a. This item includes excavation of unclassified materials as defined in Section 02315: Excavation required for construction in the areas shown on the Drawings.
b. Measurement: Measurement will be by volume (cubic yards) of unclassified excavation to the neat lines and grades on the Drawings.
c. Payment: Payment will be made at the Contract Unit Price per cubic yard.

8. Embankment Fill (Complete-In-Place) (Unit Price Item)

a. This item includes processing materials from onsite borrow areas or approved excavations to meet embankment fill requirements, transporting, placing, spreading, grading, moisture conditioning, and compaction of fill, at the locations shown on the Drawings.
b. Measurement: Measurement for payment will be made in cubic yards of embankment fill placed to the neat lines and grades shown on the Drawings.
c. Payment: Payment will be made at the Contract Unit Price per cubic yard.

9. Aggregate Base Course (Unit Price Item)

a. This item includes procuring from offsite sources, transporting, placing, spreading, grading, moisture conditioning, and compaction of aggregate base course at the locations shown on the Drawings.
b. Measurement: Measurement for payment will be made in cubic yards of aggregate base course placed to the neat lines and grades shown on the Drawings.
c. Payment: Payment will be made at the Contract Unit Price per cubic yard.

10. Filter Sand (Unit Price Item)

a. This item includes procurement from offsite sources, transporting, placing, spreading, grading, moisture conditioning, and compaction of filter sand at the locations shown on the Drawings.
b. Measurement: Measurement for payment will be made in cubic yards of in-place filter sand placed to the neat lines and grades shown on the Drawings.
c. Payment: Payment will be made at the Contract Unit Price per cubic yard.

11. Toe Drain (Unit Price Item)

a. This item includes procuring, transporting, installing drain components including HDPE drain pipe, pipe fittings, couplers, cleanouts, and drain gravel, placed to the neat lines and grades as shown on the Drawings. Also includes camera surveys of the completed pipe installation.
b. Measurement: Measurement for payment shall be by length (in feet) of piping installed measured along the centerline of the piping from end to end, not including the additional length of cleanouts. Pipe fittings, couplers, cleanouts, and drain gravel are considered incidental and will not be included in measurement for payment.

c. Payment: Payment will be made at the Contract Unit Price per linear foot.

12. Riprap Bedding (Unit Price Item)

a. This item includes procurement from offsite sources, transporting, placing, spreading, moisture conditioning, and grading drain gravel placed as riprap bedding to the lines and grades shown on the Drawings.
b. Measurement: Measurement for payment will be made in cubic yards of drain gravel placed as riprap bedding material placed to the neat lines and grades shown on the Drawings.
c. Payment: Payment will be made at the Contract Unit Price per cubic yard.

13. Riprap (Unit Price Item)

a. This item includes processing riprap from on-site sources, transporting, placing, spreading, and grading of riprap to the lines and grades shown on the Drawings.
b. Measurement: Measurement for payment will be made in cubic yards of riprap placed to the neat lines and grades shown on the Drawings.
c. Payment will be made at the Contract Unit Price per cubic yard.

14. Retaining Wall Concrete (Unit Price Item)

a. This item includes procuring, batching, transporting, forming, placing, vibrating, finishing, and curing reinforced structural concrete for the retaining wall. Also includes procuring transporting, and installing reinforcing steel, accessories and joint preparation. Item also includes furnishing and installing structural survey point on the wall when shown on the Drawings.
b. Measurement: Measurement for payment shall be by volume (cubic yards) of concrete placed to the neat lines and grades shown on the Drawings.
c. Payment: Payment will be made at the Contract Unit Price per cubic yard.

15. Handrail (Unit Price Item)

a. This item includes furnishing and installing the handrail on the retaining wall as shown on the Drawings.
b. Measurement: Measurement will be based on the approved schedule of values.
c. Payment: Payment will be made at the Contract Lump Sum Price.

16. Piezometers (Unit Price Item)

a. This item includes all work associated with furnishing and installing new piezometers at the locations shown on the Drawings, and in accordance with the details shown and specified. Item also includes obtaining required permits, completion survey, and required regulatory construction documentation.
b. Measurement: Measurement for payment shall be by total length (in feet) of piezometers measured from the ground surface to the tip of the well

casing. Surface completion details, including protective casing and concrete are considered incidental and will not be included in measurement for payment.

c. Payment: Payment will be made at the Contract Unit Price per linear foot.

17. Topsoil Placement (Unit Price Item)

a. This item includes hauling topsoil from stockpiles, spreading, and grading topsoil evenly over the areas to be reclaimed.
b. Measurement: Measurement will be by volume (cubic yards) of topsoil placed as measured in the stockpiles after stripping.
c. Payment: Payment will be made at the Contract Unit Price per cubic yard.

18. Seeding and Reclamation (Unit Price Item)

a. This item includes procuring, transporting, and placing materials required for reclamation where shown on the Drawings or as specified.
b. Measurement: Measurement will be by area (square acres) of areas seeded, measured to the nearest hundredth of an acre.
c. Payment: Payment shall be made at the Contract Unit Price per square acre.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01310
PROJECT COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 WORK INCLUDED IN THIS SECTION

A. The work of this section includes, but is not limited to: coordination; preconstruction meeting; progress meetings; and task start-up meetings.

1.2 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Specifications to assure efficient and orderly sequence of installation of interdependent construction elements.

B. Coordinate all work with progress meetings to explain unique features of the work to the work forces. The Engineer may attend such meetings. Meet daily with the Engineer to explain work progress, quality control, and any issues affecting successful completion of the work.

C. Coordinate completion and clean up of work of separate sections in preparation for Substantial Completion.

D. After the Owner occupancy of premises, coordinate access to site for correction of defective work and the work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 PRECONSTRUCTION MEETING

A. Within ten days after Notice to Proceed and prior to starting the Work except mobilization, the Contractor, accompanied by a representative from each principal subcontractor, shall meet with the Owner and the Engineer for a Preconstruction Meeting. The Preconstruction Meeting will be scheduled by the Owner. The principal features of work will be reviewed and any questions regarding the Contract and work site will be addressed.

B. Attendance Required: the Owner, the Engineer, the Colorado SEO Dam Safety Representative, the Contractor's Superintendent, the Contractor's Safety and Health Officer, principal subcontractors, and other key personnel as requested by the Contractor, Owner, or Engineer.

C. Bring the following schedules to the preconstruction meeting:

1. Preliminary Progress Schedule.
2. Procurement schedule.
3. Shop Drawings and other submittals schedule.
4. Schedule of Values.

D. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

1. Distribution of Contract Documents as applicable, including Contractor’s executed bond, certificate of insurance, and Contract.

2. Submission of list of Subcontractors, list of Products, schedule of values, and preliminary progress schedule.
3. Designation of personnel representing the parties in the Contract, and the Engineer.
4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
5. Contractor's schedules.
6. Critical Work sequencing.
7. Processing Applications for Payment.
8. Field decisions and Change Orders.
9. Use of premises by the Owner, the Engineer and the Contractor.
10. Owner's requirements.
11. Construction facilities and controls provided by the Owner.
12. Use of premises, office and storage areas, security, housekeeping, and Owner's needs.
13. Survey and layout.
14. Security and housekeeping procedures.
15. Contractor's assignments for safety and first aid.
16. Quality Control and Inspection Program.
17. Procedures for maintaining record documents.
18. Major equipment deliveries and priorities.
19. Requirements for start-up of equipment.
20. Inspection and acceptance of equipment put into service during construction period.
21. SEO Requirements.
22. Record drawings.

E. The Engineer will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

1.4 PROGRESS MEETINGS

A. The Engineer will schedule and hold regular progress meetings at least weekly and at other times as requested by the Owner or required by progress of the Work. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

B. Additional meetings may be called by the Owner, the Engineer, or the Contractor during any stage of the project when it is deemed necessary to raise any significant questions, establish new guidelines, introduce a new aspect to the project, or any other items that will affect the progress of work.

C. Meetings may take place at the project site or some other location that is satisfactory to the Owner, the Engineer and the Contractor.

D. The Engineer will make arrangements for meetings, preside at meetings, and prepare agendas with copies for participants.

E. Attendance Required: The Contractor and all Subcontractors active on the site shall be represented. The Contractor may at its discretion request attendance by representatives of its Suppliers, manufacturers, and other Subcontractors.

F. All expenses associated with attending the meetings that are incurred by other than the Owner and the Engineer shall be born by the Contractor.

G. Proposed Agenda:

1. Review and approval of minutes of previous meetings.
2. Review of Work progress of minutes of previous meeting.
3. Field observations, problems, conflicts, and decisions.
4. Identification of problems which impede the schedule and proposed corrective actions.
5. Review of submittals schedule and status of submittals; expedite as required.
6. Requests for information status.
7. Review of off-site fabrication and delivery schedules.
8. Revisions to project schedule.
9. Maintenance of progress schedule.
10. Corrective measures and procedures to regain projected schedules.
11. Planned progress during succeeding Work period.
12. Coordination of project schedules and projected progress. Review of three week look-ahead schedule provided by Contractor to ensure proper coordination with Owner, Engineer, and subcontractors.
13. Maintenance of quality, and Safety and Work standards.
14. Pending changes and substitutions.
15. Effect of proposed changes on progress schedule and coordination, and effect on other contracts of the project.
16. Other business relating to Work.

H. The Engineer will document the meeting; include significant proceedings and decisions and distribute copies after meeting to participants and those affected by decisions made.

1.5 TASK START-UP MEETING

A. Before the start of any significant site activity, as determined by the Engineer, conduct a start-up meeting to discuss procedures, quality control, inspections, and related activities. Attendance at the meeting should include the Contractor project manager, site supervisor, representatives of key Subcontractors, and the Engineer and his designated representatives. Notify Engineer at least 72 hours in advance of meeting to allow the Engineer to invite necessary offsite personnel.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01320
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SUMMARY

A. Construction Progress Schedule developed in accordance with this Section and the General Conditions.

B. The Contractor is required to provide all information and input for development of the Construction Progress Schedule in accordance with this Section and the General Conditions.

1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. With each Progress Schedule submission provide the following:

1. Contractor certification that progress schedule submission is the actual schedule being utilized for execution of the Work and certification by all Subcontractors with 10 percent or more of Work that they concur with Contractor progress schedule submission.
2. Five legible copies of the progress schedule.

C. Preliminary Progress Schedule:

1. Unless otherwise provide in the Contract Documents, within 10 days following the effective date of the Agreement, prepare and submit a preliminary Critical Path Method (CPM) Gantt progress schedule covering all Work to be done on the Project. Include the major construction activities and their durations and start/finish dates.
2. The Gantt schedule and subsequent revisions shall be submitted to the Owner and shall reflect the actual progress of the Project to within 5 days prior to submittal.
3. If the schedule or any subsequent revision is not acceptable to Owner, the schedule shall be revised and resubmitted as many times as necessary until the schedule is acceptable. Acceptance of the schedule will not be unreasonably withheld.
4. The initial progress schedule, when accepted by the Owner, will be the project baseline schedule.

D. Monthly Progress Schedule: Submit adjusted schedule or confirm validity of current schedule with each monthly Application for Payment in accordance with this Section and the General Conditions, and at such other times as necessary to reflect the following:

1. Progress of Work to within 5 days prior to submission.
2. Changes in Work scope and activities modified since submission.
3. Delays in Submittals or resubmittals, deliveries, or Work.
4. Adjusted or modified sequences of Work.
5. Other identifiable changes.

6. Revised projections of progress and completion.

E. Submittals, Shop Drawings and Engineering Data Schedule.

1. At the time the preliminary Gantt progress schedule is submitted, submit a schedule for materials, equipment, qualifications, plans, and data for which Shop Drawings and/or engineering data required by the Specifications. For each required submittal item, the date shall be given for intended submission of the item to Engineer for review and the date required for its return to avoid delay in any activity beyond the scheduled start date. Sufficient time shall be allowed for initial review, correction and resubmission, and final review of all submittals.

F. Narrative Progress Report: Submit with each monthly submission of progress schedule.

1.3 PROGRESS OF THE WORK

A. If Contractor fails to complete activity by its latest scheduled completion date and this failure may extend Contract Times (and/or Milestones), Contractor shall, within 7 days of such failure, submit a written statement as to how Contractor intends to correct nonperformance and return to the acceptable current progress schedule. Actions by Contractor to complete Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.

B. Engineer may request a schedule recovery or mitigation plan if Contractor fails to: (i) complete a critical scheduled activity by its latest Milestone completion date, or (ii) satisfactorily execute Work as necessary to prevent delay to the overall completion of the Work.

1.4 PRELIMINARY PROGRESS SCHEDULE

A. As a minimum, submit two computer generated Critical Path Method (CPM) schedules as follows:

1. Project Overview Plan: Show major components of the Work and the sequence relations between major components and subdivisions of major components. The chart shall indicate the relationship and time frames in which the various facilities will be made substantially complete and placed into service in accordance with the Project Milestones. Sufficient detail shall be included for the identification of subdivisions of major components into such activities as:

a. Mobilization
b. Project Controls
c. Clearing and Grubbing and Stripping
d. Demolition and Site Preparation
e. Reservoir Access Road
f. Borrow Area
g. Downstream Dam Excavation
h. Toe Drain Installation
i. Dam Filter Blanket and Buttress
j. Upstream Riprap and Drain Gravel Bedding
k. Instrumentation
l. Reclamation of Disturbed Areas
m. Demobilization

B. Planned durations and start dates shall be indicated for each Work item subdivision. Work item durations for any activity shall not exceed thirty (30) working days. Each major component and subdivision component shall be accurately plotted on time scale sheets 11 inches by 17 inches or 24 inches by 36 inches in size. Not more than four sheets shall be employed to represent this overview information.

C. Submit in accordance with Section 01330: Submittal

D. The initial progress schedule, when accepted by the Engineer, will be the project baseline schedule.

1.5 PROGRESS SCHEDULE

A. General:

1. Schedule(s) shall reflect Work logic sequences, restraints, delivery windows, review times, Contract Times, and Milestones set forth in the Agreement, and shall begin with the date of Notice to Proceed and conclude with the date of Final Completion.
2. The schedule requirement herein is the minimum required. Contractor may prepare a more sophisticated schedule if such will aid Contractor in execution and timely completion of Work.
3. Submit assumptions for base schedule describing work week duration, numbers of shifts, hours per shift, holidays, assumed weather days, assumed productivity, crew size, etc.
4. Adjust or confirm schedules in accordance with this Section and the General Conditions on a monthly basis.
5. The update of the Project Schedule shall be an integral part of the estimate upon which progress payments will be made. . If, in the judgment of the Owner, the Contractor fails or refuses to provide information required to accomplish a complete Project Schedule Update or revision as specified hereafter, the Contractor shall be deemed to have not provided the required estimate upon which progress payments may be made, and shall not be entitled to progress payments until it has furnished the information necessary for a complete schedule update to the satisfaction of the Owner.
6. Float time is a Project resource available to both parties to meet contract Milestones and Contract Times.
7. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and use of float time disclosed or implied by use of alternate float-suppression techniques shall be shared to proportionate benefit of Owner and Contractor.
8. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs which (i) impacts Project's critical path, (ii) consumes available float or contingency time, and (iii) extends Work beyond contract completion date.
9. If Contractor provides an accepted schedule with an early completion date, The Owner reserves the right to reduce Contract Times to match the early completion date by issuing a deductive Change Order at no change in Contract Price.

B. Format:

1. Computer generated baseline schedule, on maximum 11-inch by 17-inch or 24-inch by 36-inch sheet size to include at least:

    a. Identification and listing in chronological order of those activities reasonably required to complete Work, including, but not limited to, subcontract work, fabrication, and delivery dates including required lead times, move-in and other preliminary activities, Project closeout and cleanup, and specified Work sequences, constraints, and Milestones, including Substantial Completion date(s). Listings to be identified by Specification section number.
    b. Identify: (i) horizontal time frame by year, month, and week, (ii) duration, early-start, and completion for each activity and subactivity, and (iii) critical activities and Project float, (iv) assumed weather allowances, (v) planned holidays, (vi) production rates and (vii) assumed work hours per day and number of work days per week.
    c. Subschedules to further define critical portions of the Work.
    d. Monthly Schedule Submissions: Show overall percent complete, projected and actual, and completion progress by listed activity and subactivity.

1.6 NARRATIVE PROGRESS REPORT

A. Include, as a minimum:

1. Summary of Work completed during the past period between Narrative Progress Reports.
2. Work planned during the next period.
3. Explanation of differences between summary of Work completed and Work planned in previously submitted Narrative Progress Report.
4. Current and anticipated delaying factors and their estimated impact on other activities and completion Milestones.
5. Corrective action taken or proposed.

1.7 REPORTS

A. A status report signed by the Contractor shall be submitted weekly to the Engineer at the weekly progress meeting. Delinquency in submitting weekly status reports may result in delay of progress payments. The weekly status report shall include a summary of completed work, and a three-week "Look Ahead" bar chart schedule.

B. Submit a monthly progress report, listing all construction activities and their scheduled completion dates. Activities shall show the percent completion and the days required for completion, and shall be forwarded to the Engineer no later than the fifth working day after the last working day of the month the report is based on. Requests for progress payments shall be accompanied by the latest pertinent report.

1.8 CLAIMS FOR ADJUSTMENT OF CONTRACT TIMES

A. Reference the General Conditions.

B. Where Engineer and Owner has not yet rendered formal decision on Contractor claim for adjustment of Contract Times, and parties are unable to agree as to amount of adjustment to be reflected in progress schedule, Contractor shall reflect that amount of time

adjustment in progress schedule as Engineer and Owner may accept as appropriate for the interim. . It is understood and agreed that such interim acceptance by Engineer and Owner will not be binding and will be made only for purpose of continuing to schedule Work, until such time as formal decision as to an adjustment, if any, of the Contract Times acceptable to the Engineer and Owner has been rendered. Contractor shall revise progress schedule prepared thereafter in accordance with Engineer and Owner formal decision.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01330
SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal requirements. Submittals shall be in accordance with this Section and the General Conditions.

1.2 CONFLICTS

A. In the event of conflict between this Section and the General Conditions, the more restrictive requirements shall apply.

1.3 DEFINITIONS

A. Work-related submittals of this Section are categorized for convenience as follows:

1. Product Data: Product Data includes standard printed information on materials, products and systems not specifically prepared for the Work, other than designation of selections from among available choices printed therein.
2. Shop Drawings: Shop Drawings includes specially prepared technical data for the Work, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to other contracts.
3. Samples: Samples includes both fabricated and unfabricated physical examples of materials, products and units of Work; both as complete units and as smaller portions of units of Work; either for limited visual inspection or, where indicated, for more detailed testing and analysis.
4. Miscellaneous Submittals: Miscellaneous Submittals includes construction permits, reports, project photographs, survey data and reports, physical Work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data; and similar information, devices and materials applicable to the Work and not processed as Product Data, Shop Drawings or Samples.

1.4 QUALITY ASSURANCE

A. Submittals shall verify compliance with the Contract Documents, and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment. When an item consists of components from several sources, Contractor shall submit a complete initial submittal including all components.

B. The Engineer will review submittals only for general conformance with the design concept. Such review by the Engineer shall not relieve the Contractor or any subcontractor of responsibility for full compliance with Contract requirements; for correctness of dimensions, clearances and material quantities; for proper designing of

details; for proper fabrication and construction techniques; for proper coordination with other trades; or for providing all devices required for safe and satisfactory construction and operation.

1.5 SUBMITTAL SEQUENCING AND SCHEDULING

A. Coordinate preparation and processing of submittals with performance of the Work so that Work will not be delayed by submittals.

B. Coordinate and sequence different categories of submittals for the same Work, and for interfacing units of Work, so that one will not be delayed for coordination with another.

C. Make all submittals far enough in advance of scheduled installation/construction dates to provide all time required for reviews, for possible revisions and resubmittals, and for placing orders and securing delivery. Submittals shall be received at least 21 calendar days prior to any scheduled work for the activity covered by the submittal unless otherwise noted in individual specification Sections or agreed to in writing by the Engineer.

D. Timing of submittals shall allow for review time by the Engineer. Engineer's submittal review period will be 14 consecutive calendar days commencing on the first calendar day following receipt of the submittal or resubmittal in Engineer's office. The time required to mail the submittal or resubmittal back to Contractor is not considered a part of the submittal review period

E. Contractor scheduling shall include preparation of a submittal schedule to be coordinated with the Contractor’s construction sequencing and scheduling, including allowance for Engineer review time.

1.6 SUBMITTALS

A. Submit a log of all submittals required by the Specifications with planned submittal dates coordinated with the Contractor’s construction sequencing and scheduling including allowance for Engineer review time, and organized by Specification Section and Paragraph.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.1 SUBMITTAL PROCEDURES

A. Process submittals in accordance with this section.

B. Resubmissions will be handled in the same manner as first submissions. Direct specific attention, in writing or on the resubmittal, to revisions other than the corrections requested by the Engineer on previous submittals using the notation specified in this Section. All requirements specified for initial submittals also apply to resubmittals. Resubmittals shall be made within 7 days of the date of the letter returning the material to be modified or corrected.

C. Transmit submittals with a pre-printed letter of transmittal form of Contractor's choosing, dated and signed, with the job title and Section(s) of the Specification requiring the submittal clearly indicated. The forms shall be sequentially numbered based on Section (e.g., 03 33 00-1, 03 33 00-2 etc.) Resubmittals shall have the original number together with an alphabetic suffix (A, B, C….) indicating the number of resubmittals.

D. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. Indicate the current revision, issue number, and date shall be indicated on all drawings and other descriptive data. Identify specific variations from the Contract Documents and Product or system limitations which conflict or may be detrimental to successful performance of the completed Work.

E. By signing the submittal, the Contractor certifies that review, verification of products required, field dimensions and coordination of information is in accordance with the Work as specified in the Contract Documents.

F. Submittal shall contain Contractor's executed review and approval marking. Provide space for the Contractor's stamp and Engineer's review stamp (approximately 3½ inches by 2½ inches).

G. Submittals which are received from sources other than through Contractor's office will be returned "without action."

H. Revise and submit resubmittal as required and identify all changes made since the previous submittal.

I. Distribution:

1. Distribute copies of reviewed submittals to all subcontractors whose Work will interface with the subject of the submittal.
2. Provide additional distribution of submittals (not included in other copy submittal requirements specified in this Section) to subcontractors, suppliers, fabricators, installers, governing authorities and others as necessary for performance of the Work.
3. Submit hard copies as follows:

    a. One copy to Owner.
    b. Three copies to Engineer.

4. The Engineer will return one electronic copy to Contractor marked with review comments. Engineer will not accept submittals from anyone but Contractor.

J. Electronic Submittals:

1. Furnish submittals including shop drawings in legible electronic format. At the Engineer’s request, provide hard copies of complicated or oversized submittals in addition to providing them electronically. For electronic submittals, submit to the Engineer as specified below.
2. Electronic submittal documents may be in black and white unless color is required for the review of the submittal. All electronic files shall be in Portable Document Format (PDF) as generated by Adobe Acrobat Professional Version 7.0 or later.

3. PDF document properties shall include the submittal number for the document title and the Contractor's name for the author. Electronic submittal file sizes shall be limited to 10MB. When multiple files are required for a submittal the least number of files possible shall be created.
4. Electronic submittal requirements also apply to proprietary project documentation management systems if used. Include access to such system to specific individuals or entities as directed by the Engineer.

3.2 PROPOSED PRODUCT LIST

A. Within 30 days from execution of the Agreement between Owner and Contractor, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product, and the lead time for procurement, fabrication and delivery of all products with a lead time of more than 30 days.

B. For products specified only by reference standards, give manufacturer, trade names, model or catalog number, and reference standard.

3.3 PRODUCT DATA, SHOP DRAWINGS, AND SAMPLES

A. Product Data:

1. Collect required data into one submittal for each unit of Work or system; and mark each copy to show which choices and options are applicable to the Work. Include manufacturer's standard printed recommendations for application of labels and seals, notation of field measurements, which have been checked, and special coordination requirements.
2. Maintain one set of Product Data (for each submittal) at project site, available for reference by Engineer/Owner and others.
3. Submit number of copies required by Contractor plus two (2) copies which will be retained by Engineer.
4. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide all information unique to this Project.

B. Shop Drawings:

1. Submit number of copies required by Contractor plus two (2) copies which will be retained by Engineer.

C. Samples:

1. Provide units identical with final condition of proposed materials or products for the Work.
2. Include "range" samples (not less than three units) where unavoidable variations must be expected, and describe or identify variations that must be expected, and describe or identify variations between units of each set.
3. Provide full set of optional samples where Engineer's/Owner’s selection is required. Prepare samples to match Engineer's sample where so indicated.
4. Include information with each sample where so indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture, and "kind" by Engineer.

5. Engineer will not "test" samples (except as otherwise indicated) for compliance with other requirements, which are therefore the exclusive responsibility of the Contractor.

3.4 MISCELLANEOUS SUBMITTALS

A. Construction Permits:

1. Contractor shall acquire, maintain, and submit three copies of all construction permits (except Owner’s acquired permits) that are required by the agencies to execute the Work.

B. Manufacturers' Instructions:

1. When specified in individual specification Sections, submit three copies of manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing.
2. Identify conflicts between manufacturers' instructions and Contract Documents.

C. Manufacturers' Certificates:

1. When specified in individual specification Sections, submit three copies of manufacturers' certificates to Engineer.
2. Indicate that a material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
3. Certificates may be recent or previous test results (within one year), on material or Product, but must be applicable to Product and acceptable to Engineer.

D. Tests and Test Reports:

1. Classify each as either "project related" or Product Data, depending upon whether report is uniquely prepared for project or a standard publication of workmanship control testing at point of production, and process accordingly.
2. All test equipment used shall be verified to be in calibration at the time of each test and test reports shall so indicate. No test shall be made without such verification.

E. Substitution Request:

1. When Contractor desires to use a product, procedure, or other item not detailed in the Drawings or Specification a substitution request must be submitted including the following:

    a. Reason for substitution.
    b. Schedule of costs.

2. Substitution request must be submitted at least 14 calendar days prior to planned procurement.

3.5 SUBMITTALS PROCESSING

A. Submittals reviewed by the Engineer and returned to the Contractor will be marked with one of the following designations:

1. No Exceptions Taken
2. Furnish As Noted
3. Revise and Resubmit
4. For Information Only

B. Revise and Resubmit

1. Do not proceed with manufacture.
2. Make corrections and resubmit.

C. Furnish As Noted

1. Contractor may proceed with manufacture at its own risk on the basis of incorporating all comments noted on the returned drawings and data.
2. Make corrections and resubmit.

D. No Exceptions Taken

1. Construction may be carried out in accordance therewith and no further changes made therein except upon written instructions from the Engineer. Final drawings (paper, mylar, or electronic) and/or microfilms shall be submitted to the Engineer.

E. For Information Only

1. Submittals returned with For Information Only indicate they do not require action, and the response is to acknowledge receipt.

END OF SECTION

SECTION 01350
ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Landscape preservation; prevention of water pollution; abatement of air pollution; abatement of noise; temporary drainage provisions, and noxious weed control.

1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Complete Environmental Plan as part of the Work Plan required in Section 01120. Detail in the Environmental Plan the equipment, materials, and methods that will be used to comply with the requirements in this section and other regulatory requirements not specifically listed in this Section.

1.3 LANDSCAPE PRESERVATION

A. Exercise care to preserve the existing landscape outside of specified limits of areas of site disturbance. Conduct construction operations to prevent any unnecessary destruction, scarring, or defacing of the natural or man-made surroundings in the vicinity of the work.

B. The edges of clearings and cuts through trees, shrubbery, and vegetation shall be irregularly shaped to soften the undesirable visual impact of straight lines. Movement of crews and equipment within the right-of-way, within easements, and over routes provided for access to the work shall be performed in a manner to prevent damage to vegetation and property.

C. All destruction, scarring, damage, or defacing of the landscape resulting from the Contractor's operations shall be repaired, replanted, reseeded, or otherwise corrected as directed by the Owner and at the Contractor's expense.

D. The locations, alignments, and grades of construction roads are subject to approval of the Owner. Site clearing shall be conducted in accordance with Section 02230: Clearing and Grubbing. Restore areas of construction roads and staging, stockpiling/disposal and storage areas to the original topographic contours except as otherwise specified for excess excavation materials, when no longer required by the Contractor. Reclaim and reseed all areas disturbed by construction shall be reclaimed in accordance with Section 02920: Seeding and Reclamation of Disturbed Areas. Conduct contouring and reclamation work in disturbed areas in such a manner as to provide for proper drainage and to prevent erosion.

E. Except where clearing is required for permanent works or excavation operations, or otherwise allowed for wetland disturbance identified on the Drawings, preserve and protect all trees, shrubbery, vegetation, and wetlands from damage by the Contractor's construction operations and equipment.

F. Exercise special care where trees or shrubs to remain are exposed to injuries by construction equipment, excavating, dumping, chemical damage, or other operations.

Adequately protect such trees by use of protective barriers or other methods approved by the Owner. Removal of trees and shrubs shall be permitted only after approval by the Owner.

G. Plan the layout of the Contractor's construction facilities such as shops, trailers, storage areas, and parking areas; location of access and haul routes; and operations in the stockpile areas in such a manner that all trees and shrubbery not approved for removal by the Owner are preserved and adequately protected from either direct or indirect damage by the Contractor's operations.

H. Do not operate equipment within any tree to be protected.

I. Do not use trees for anchorages.

J. The Contractor is responsible for injuries to trees and shrubs caused by their operations. The term injury includes, without limitation, bruising, scarring, tearing, and breaking of roots, trunks, or branches. Repair or treat all injured trees and shrubs without delay, at the Contractor's expense. If injury occurs, the Owner will determine the repair method or treatment to be used for injured trees and shrubs as recommended by a certified arborist or a licensed tree surgeon provided by and at the expense of the Contractor. Perform repairs or treatment of injured trees under the direction of a certified arborist or a licensed tree surgeon provided by, and at the expense of the Contractor.

K. Remove and replace early in the next planting season. Replace injured trees or shrubs that, in the opinion of the Owner, are beyond saving early in the next planting season. Replace with the same species, or other approved species, and of the maximum size that is practicable to plant and sustain growth in the particular environment. Replacement trees and shrubs shall be guyed, watered, and maintained for a period of one month. Remove and replace any replacement tree or shrub that dies, as directed by the Owner, and maintain for a period of one month from the replacement date. Replacement of injured trees and shrubs not required to be cleared or removed for construction shall be at the Contractor's expense.

1.4 SPILL PREVENTION AND CONTROL

A. Prepare and submit spill prevention and control procedures in the Work Plan, see Section 01120: Contractor Work Plan. Implement spill prevention and control procedures and appropriate containment and diversionary structures, materials, and equipment to prevent and control the maximum spillage of any specific item within the scope of work. This includes the materials and equipment used in connection with this project. The procedures shall ensure that sufficient inspections and tests are performed on a continuing basis. Furnish qualified personnel, appropriate facilities, instruments, equipment, and testing devices necessary for quality spill prevention and control. The spill prevention and control procedures shall be carefully thought out and prepared in accordance with all applicable Federal, State, and local laws and regulations, and good engineering practices, and address the necessary resources for procedures, methods, and equipment operations.

B. Identify spill prevention and control procedures in the Work Plan as appropriate for the material being handled and hauled by the Contractor. Design, construct, maintain, and operate preparedness and prevention facilities to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or

hazardous waste constituents to the air or surface water which could threaten human health or the environment.

C. Implement special measures to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides, insecticides, harmful materials, biological materials, and concrete materials from entering the air, waters of the U.S, utilities, and storage areas.

D. Laws and Regulations: Do not pollute any area with any manmade or natural harmful materials. It is the sole responsibility of the Contractor to investigate and comply with all applicable Federal, State, county, and municipal laws and regulations concerning spill prevention and control procedures.

E. Communications: Provide internal communications or an alarm system to provide immediate emergency instruction to facility personnel if necessary. Provide a device, such as a telephone immediately available at the scene of operations, capable of summoning emergency assistance from local police departments, fire departments, State or local emergency response teams. Include a project telephone directory in the Work Plan.

F. Dispose of materials required to be disposed of offsite in accordance with applicable Federal, State, and local laws and regulations. See Section 01575: Disposal of Waste Materials for additional requirements.

G. Required inspections and documentation shall be in accordance with written procedures developed by the Contractor. These written procedures shall be part of the Work Plan. Maintain a record of the inspections, signed by the appropriate supervisor or inspector, during the project and submit to the Engineer for final close-out.

H. If materials are released, provide a written description of the event, corrective action taken, and plans for preventing recurrence, as well as a written document of manpower, equipment, and materials required to expedite control and removal of any harmful quantity of materials released.

I. The Contractor is responsible for properly instructing Contractor personnel regarding applicable pollution control laws, rules, and regulations and in the operation and maintenance of equipment and BMPs to prevent the discharge of materials. Schedule and conduct spill prevention briefings for its operating personnel at intervals frequent enough to assure adequate understanding of spill prevention and control procedures for this project. Such briefings shall highlight and describe known spill events or failures, malfunctioning components, and recently developed precautionary measures.

J. Designate a person who is responsible for environmental protection to include but not limited to material spill prevention, BMPs maintenance, recordkeeping, permit condition compliance and who reports to management.

K. Maintain all facility communication systems and spill control equipment as necessary to assure proper operation in time of emergency.

1.5 PREVENTION OF WATER POLLUTION

A. Comply with all project permit requirements, and all other applicable federal, state, and local laws, orders, regulations, permits, and water quality standards concerning the control and abatement of water pollution.

B. Conduct construction activities by means and methods that shall prevent entrance or accidental spillage of solid matter, contaminants, debris, and other pollutants and wastes into streams, flowing or dry water courses, rivers, lakes, and underground water sources.

C. Such pollutants and wastes include, but are not restricted to: refuse, garbage, sediment from erosion of construction areas, concrete wash-out, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.

D. Do not allow wastewater from construction operations to enter streams, water courses, wetlands, or lakes without passing through suitable sedimentation ponds or treatment facilities approved by the Engineer.

E. Do not use chemicals within 100 feet of, or on slopes leading to waters of the U.S.

F. Except as specifically authorized and necessary for construction, do not stage or store equipment or materials within 100 feet of, or on slopes leading to waters of the U.S.

G. Refuel equipment in designated level fueling areas a minimum of 100 feet from waters of the U.S.

H. Where the location of a construction site is such that oil or gas from an accidental spillage could reasonably be expected to enter into or upon the navigable waters of the U.S. or adjoining shorelines, and the aggregate storage of oil or gas at the site is over 1,320 gallons, or a single container has a capacity in excess of 660 gallons, prepare a Spill Prevention Control and Counter Measure Plan (SPCC) reviewed and certified by a registered professional engineer in accordance with 40 CFR, Par 112, as required by Public Law 92-500 as amended by Public Law 95-217 and Public Law 95-576.

I. Submit to the Engineer a certified statement that the SPCC, if required, was reviewed and certified by a registered professional engineer in the state of Colorado.

1.6 ABATEMENT OF AIR POLLUTION

A. Comply with applicable federal and state laws and County ordinances and regulations concerning the prevention and control of air pollution.

B. In conducting construction activities and operation of equipment, utilize such practicable methods and devices as are reasonably available to control, prevent, and otherwise minimize atmospheric emissions or discharges of air contaminants.

C. Minimize emission of dust into the atmosphere during handling and storage of construction materials, and use such methods and equipment as are necessary to minimize or prevent dust during these operations. Keep earth surfaces subject to dusting moist with water or by application of a chemical dust suppressant if approved and allowed. When practicable, cover dusty materials in piles or in transit to prevent blowing dust.

D. Do not operate equipment and vehicles that are found to have emissions of exhaust gases or particulates that exceed applicable limits established by federal, state, or local laws or authorities e until corrective repairs or adjustments are made. If required by the Engineer, provide acceptable evidence that equipment and vehicles have been tested for exhaust emissions and have been found to be in compliance with applicable limits.

E. Carry out proper and efficient measures wherever and as often as necessary to reduce the dust nuisance, and to prevent dust from damaging crops, orchards, cultivated fields, and dwellings, or causing a nuisance to persons or adjacent properties. The Contractor shall be held liable for any damage resulting from dust originating from their operations.

1.7 ABATEMENT OF NOISE

A. Comply with applicable federal and state laws and County ordinances, orders, and regulations concerning the prevention, control, and abatement of excessive noise.

B. Take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. Equip all construction machinery and vehicles with practical sound-muffling devices, and operate in a manner to cause the least noise consistent with efficient performance of the Work.

1.8 TEMPORARY DRAINAGE PROVISIONS

A. Provide for the drainage of storm water, and such water as may be applied or discharged on the site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the site, and adjacent property.

B. Clean, enlarge, or supplement existing drainage channels and conduits as necessary to carry all increased runoff attributable to the Contractor's operations. Construct dikes as necessary to protect the Owner's facilities and the Work, and to direct water to drainage channels or conduits.

C. See also Section 01570: Sediment and Erosion Control.

1.9 NOXIOUS WEED CONTROL

A. All Contractors employees and subcontractors are required to follow the Project Weed Management Plan, and if a Plan is not in effect at the site, required to follow best practices as specified or necessary to control noxious weeds.

B. Clean and inspect all construction vehicles and equipment before, and anytime they enter the site to ensure that they are free of soil and debris capable of transporting noxious weed seeds or roots, or invasive species of terrestrial or aquatic species. Notify the Owner when construction vehicles and equipment are ready for Owner inspection. No equipment will be allowed on site without Owner approval.

C. Staging areas will not be allowed in weed-infested areas unless the staging area is pre-treated using integrated management. Weed-infested staging areas shall be mowed and cleared of noxious weeds and sprayed with the appropriate herbicide.

D. Areas of planned topsoil stripping shall be assessed for presence and abundance of noxious weeds prior to stripping. Treat areas of topsoil stripping infested with noxious weeds prior to salvage, using methods and products acceptable to the Engineer.

E. Stockpiles of topsoil that remain unmoved for greater than 30 days must be assessed for the presence and abundance of noxious weeds and treated appropriately prior to placement.

F. If construction is completed and permanent seeding cannot occur due to the time of year, a temporary cover crop or other temporary erosion control, if approved by the Engineer, may be used for temporary erosion control until seeding can occur.

G. Apply herbicides by spot spraying or as appropriate. Applicators must hold a Commercial Pesticide Applicators license in Colorado and obtain Owner approval. Perform broadcast spraying only with approval of the Owner. If broadcast spraying is allowed, the applicator shall not apply aerosols or droplets in winds over 10 mph in velocity. The Contractor shall ensure that the herbicide application does not damage native trees, shrubs, grasses and wildflowers and does not contaminate sensitive aquatic and wetland areas. Spraying adjacent to aquatic or wetland areas shall only be done with herbicides approved by CDPHE and EPA for aquatic use. Special precautions shall also be taken for pollinators and other beneficial insects. Nearby beekeepers shall be given a minimum of two weeks notice prior to start of herbicide application. All costs associated with off-target injury including but not limited to repairing or replacing foliage, fish, and insects that have been impacted by improper herbicide application shall be at the Contractor's expense.

H. If off-site borrow material is used for any part of the project, the Contractor shall certify that the material is free of noxious weeds. If any borrow is stockpiled it shall be stabilized and remain weed-free for the duration of construction.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01410
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Responsibilities for obtaining permits in accordance with federal, state, and local agencies.

1.2 GENERAL PERMIT REQUIREMENTS

A. Comply with the conditions and requirements of all permits required by federal, state, county, and local governing agencies in the performance of this Contract. If the Contractor fails to comply with the conditions and requirements of any permit and such failure to comply results in fines, penalties, and/or suspension of Work by a regulatory agency, all liability for such fines, penalties and delays are the sole responsibility of the Contractor.

B. The Contractor is responsible for obtaining all permits necessary to complete the Work. The Contractor is also responsible for all monitoring, testing, and corrective measures necessary to maintain the permits throughout the duration of the Project, including modification of or renewal of the permits as necessary. Applicable permits may include, but are not limited to, the following:

1. Dewatering Permit.
2. Haul permits.

1.3 OWNER OBTAINED PERMITS

A. The Owner is responsible for obtaining certain permits that pertain to the Work. These permits may include:

1. United States Army Corps of Engineer's (USACE) Clean Water Act Section 404 Nationwide Permit and Clean Water Act Section 401 Water Quality Certification Authorization.

B. The Contractor is responsible for implementing and coordinating the terms and requirements of all permits obtained by the Owner.

C. A copy of the permits obtained by the Owner will be provided with the Bid Documents.

1.4 RESPONSIBILITY AND COORDINATION

A. Accept full responsibility for contacting all Federal, State, and local agencies to obtain permitting requirements for construction related activities on lands under jurisdiction by those agencies, and be fully responsible to research and become familiar with regulatory requirements that must be met for the performance of the Contract Work.

B. Perform all coordination and documentation, and engineering to obtain the Contractor-required permits including providing a registered professional engineer for engineering to obtain permits where required.

C. Be fully responsible and solely accountable for meeting the requirements of all permits.

D. Unless otherwise specified by an agency, the Contractor shall be the sole permittee for all contractor-obtained permits.

1.5 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Contractor-Obtained Permits: Copies of all permits obtained by the Contractor.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01415
STATE ENGINEER REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Authority of the State of Colorado Office of the State Engineer.

1.2 REFERENCES

A. Dam Safety Project Review Guide June 27, 2014, Dam Safety Branch, Division of Water Resources, Office of the State Engineer, Department of Natural Resources.

B. Rules and Regulations for Dam Safety and Dam Construction, January, 2007, Division of Water Resources, Office of the State Engineer, Department of Natural Resources.

1.3 QUALITY CONTROL

A. Plans and Specifications

1. Approved plans and specifications shall not be materially changed without the prior written approval of the State Engineer. Construct the work in accordance with the approved plans and specifications.

B. Quality of Work

1. The State Engineer has the authority to require the material used and the work of construction to be accomplished according to rules and regulations and that construction shall not be considered complete until the State Engineer has accepted the same in writing. The State Engineer may also conduct periodic inspections of the Work. Provide State Engineer access to the work at all reasonable times.
2. The Owner's Engineer will monitor the quality of construction as specified in Rule 9 of the Rules and Regulations for Dam Safety and Dam Construction, January, 2007.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01450
QUALITY CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Contractor quality program and testing requirements.

1.2 DEFINITIONS

A. Specific quality control requirements for the Work are indicated throughout the Contract Documents. The term "Quality Control" includes inspection, sampling and testing, and associated requirements furnished by the Contractor.

B. The term "Quality Assurance" includes inspection, sampling and testing which may be performed by the Engineer.

C. Registered Engineer: Wherever references are made in these Specifications to a registered or professional engineer, it means a professional engineer (P.E.) registered with the State of Colorado.

1.3 REFERENCES

A. American Society for Testing and Materials

1.	ASTM C 1077	Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
2.	ASTM D 3740	Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
3.	ASTM E 329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

1.4 SAMPLING AND TESTING

A. Except as otherwise required, conduct all sampling and testing in accordance with the methods prescribed in the standards of the ASTM, ACI, AWWA, AWS, and other specified standards in place at time of Notice to Proceed, as applicable to the class and nature of the article or materials considered. The Engineer may use any generally accepted system of inspection that, in the opinion of the Engineer, will ensure the Engineer that the quality of the workmanship is in full accord with the Contract Documents.

B. The Engineer may waive tests or quality assurance measures. Waivers of any specific testing or other quality assurance measure are not to be construed as a waiver of any technical or qualitative requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the Engineer may make independent investigations and tests. Failure of any portion of the Work to meet any of the qualitative

requirements of the Contract Documents, are considered reasonable cause for the Engineer to require the removal, or correction, and reconstruction of any such work.

D. The Engineer may independently select, test, and analyze, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests or analyses made by the Contractor to determine compliance with the applicable specifications for the materials. If any portion of the work fails to meet the requirements of the Contract Documents, all costs of such independent inspection and investigation and all costs of removal, correction, reconstruction, or repair of any such work shall be borne by the Contractor.

1.5 QUALITY ASSURANCE/CONTROL

A. Provide a quality control system to perform inspections, tests, and retesting in the event of failure of items of work, including that of subcontractors, to ensure compliance with the Contract provisions. Establish quality control/quality assurance for all work.

B. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

C. Comply fully with manufacturers' instructions, including each step in sequence.

D. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

E. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

F. Perform work by persons qualified to produce workmanship of specified quality.

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

H. For Products or workmanship specified by association, trades, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

I. Obtain copies of standards when required by Contract Documents.

J. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

K. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.6 INSPECTION PROCEDURES

A. Perform preparatory inspection before beginning any work, and, in addition, before beginning each segment of work. Preparatory inspection must include a review of the Contract requirements, the review of shop drawings and other submittal data, a check to ensure that required control testing will be provided, a physical examination to ensure that materials and equipment conform to approved shop drawings and submittal data, and a check to ensure that required preliminary work has been completed.

B. Perform an initial inspection as soon as a representative segment of the particular item of work has been accomplished. Initial inspection to include performance of scheduled tests, examination of the quality of workmanship, a review for omissions or dimensional errors, and approval or rejection of the initial segment of the work.

C. Perform follow-up inspections as necessary, and shall include continued testing and examinations to ensure continued compliance with the Contract requirements.

D. Provide test results citing the Contract requirements, the test or analysis procedures used, and the actual test results, and include a statement that the item tested or analyzed conforms or fails to conform to the specification requirements. Each report shall be conspicuously noted in large letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements as the case may be. Have test reports signed by a testing laboratory representative authorized to sign certified test reports. Arrange for immediate delivery of the signed original of all test reports, certifications, and other documentation to the Engineer.

1.7 INDEPENDENT INSPECTION AND TESTING LABORATORY SERVICES

A. Perform all tests that require independent testing to determine compliance with the Contract Documents by an independent commercial testing paid for by the Contractor and acceptable to Engineer. Staff testing firm with experienced technicians, supervised by an engineer, and properly equipped and fully qualified to perform the tests in accordance with the specified standards.

B. Independent Testing Firm Requirements:

1. At least 10 years of experience in soil and concrete inspection and testing.
2. Meet the requirements of ASTM D 3740 and ASTM E 329.
3. Approved for testing by CDOT.
4. Accredited in accordance with the requirements of ASTM C 1077.
5. Equipped to perform all field and laboratory tests specified.

C. Submit the name of the independent testing firm and laboratory and a statement of its qualifications. Obtain the Engineer’s acceptance of the testing firm before having services performed, and pay all costs for these testing services.

D. Submit names and resumes of the laboratory's key personnel and field testing personnel. Requirements:

1. Field Technicians: At least 3 years experience in soil and/or concrete testing as applicable, and cannot be changed without prior approval of the Engineer. Concrete testing technicians shall possess a current American Concrete Institute field-testing grade one certification.
2. Laboratory technician—Technicians conducting concrete laboratory testing shall be certified as ACI Concrete Laboratory Testing Technician – Level 1 or ACI Concrete Strength Testing Technician, unless otherwise specified.

E. The Engineer may inspect work performed by the independent testing firm, both at the project site and at the laboratory. This shall include inspection of the independent testing laboratory’s internal quality assurance records, including, but not limited to quality assurance manual, equipment calibrations, and proficiency sample performance.

F. Conduct quality control testing for each item of Work to confirm work is in accordance with the contract documents.

G. Written results of all completed tests and inspections performed by the Contractor's independent testing firm shall be available to the Engineer by the end of the next working day following completion of the tests. Verbal results shall be provided to the Engineer upon test completion. Results of all completed tests shall be submitted to the Engineer.

H. Reports will indicate observations and results of tests and indicate compliance or non-compliance with Contract Documents.

I. Retesting required because of non-conformance to specified requirements is the Contractor's responsibility and shall be performed by the Contractor's approved testing agency.

1.8 ENGINEER TESTING

A. Engineer may perform and pay for quality assurance inspection and testing at their discretion, independent of testing and inspections performed by Contractor or their hired independent testing firm.

B. Cooperate with Engineer; furnish samples of materials, equipment, tools, storage, access, and assistance as requested.

C. Notify Engineer 24 hours prior to QC testing or sampling.

D. Engineer may obtain samples of material for testing. Provide Engineer access and assistance in obtaining samples.

E. Engineer may inspect Contractor off-site producers of materials and products. Provide access to these off-site facilities to the Engineer at all times during the Work.

F. Testing services performed by the Engineer are for the sole benefit of the Owner. Test results will be made available to the Contractor. Testing necessary to satisfy the Contractor's internal quality control procedures are the sole responsibility of the Contractor.

G. The Engineer will furnish the Contractor with one courtesy copy of each field and laboratory quality assurance test conducted by the Engineer.

1.9 QC PLAN REQUIREMENTS

A. Provide personnel with assigned QC functions reporting to a qualified and experienced, full time Field QC Representative. The Field QC Representative must be assigned to report to a Senior Manager of the Contractor and shall have no supervisory or managerial responsibility over the work force. Persons performing QA/QC functions shall have qualifications, authority, and organizational freedom to identify quality problems and to initiate and recommend solutions. Make available evidence of QC personnel qualifications upon request by the Engineer. The Field QC Representative must be onsite not less than the daily working hours specified in the Contract Documents to remedy and demonstrate that work is being performed properly and to make multiple observations of

all work in progress. The Field QC Representative shall prepare a daily and weekly status report and present it at the weekly progress meeting.

B. The QC Plan shall include a statement by the Senior Manager designating the Field QC Representative and specifying authorities delegated to the Field QC Representative to direct cessation or removal and replacement of defective work.

C. The QC Plan shall ensure the achievement of acceptable quality throughout all applicable areas of the Contract Documents. Describe in the QC Plan the QC program and include procedures, work instructions, and records for each section within the Contract Documents. In addition, the QC Plan describe methods relating to each section which require special testing and procedures as noted in the Contract Documents.

D. Identification and Control of Items and Materials: Include procedures to ensure that items or materials that have been accepted at the site are properly used and installed, for proper identification and storage, and to prevent the use of incorrect or defective materials.

E. Inspection and Tests: Have written procedures defining a program for control of inspections performed.

1. Perform and document inspections and tests by qualified individuals. At a minimum, “qualified” means having performed similar QC functions on similar type projects. Maintain and submit records of personnel experience, training, and qualifications for review by the Engineer.
2. Maintain and provide to the Engineer, within two working days, acceptable records following completion of each inspection and test. Document and evaluate inspection and test results sufficient to ensure that requirements have been satisfied.
3. Procedures shall include:

    a. Specific instructions, organized by specification section, defining procedures for observing all work in progress and comparing this work with the Contract requirements;
    b. Specific instructions for noting deficiencies and steps to be taken to have the deficiency corrected, repaired or replaced;
    c. Specific instructions for recording all observations and requirements for demonstrating through the reports that the work observed was in compliance or a deficiency was noted and action to be taken;
    d. Procedures to preclude the covering of deficient or rejected work;
    e. Procedures for halting or rejecting work; and
    f. Procedures for resolution of differences between the QC Representative’s and the foreman, or site superintendent.

4. The QC Plan shall identify all contractual hold/inspection points, as well as any Contractor imposed hold/inspections points.
5. The QC Plan shall include procedures to provide verification and control of all testing provided by Contractor, including, but not limited to the following:

    a. Verifying and noting on the Daily Report all required testing was performed and documenting results if available, including a sample of the Contractor's Daily Report;

b. Providing for location maps for all tests performed or location of work covered by the tests;
c. Maintaining copies of all test results;
d. Ensuring the Engineer receives an independent copy of all tests;
e. Ensuring testing lab(s) are functioning independently and in accordance with the Contract Documents; and
f. Ensuring re-tests are properly taken and documented.

F. Control of Measuring and Test Equipment: Measuring and/or testing instruments shall be maintained, calibrated, and adjusted to maintain accuracy within prescribed limits. Perform and document calibration at specified periods against valid standards traceable to nationally recognized standards.

G. Supplier Quality Assurance: The QC Plan shall include procedures to ensure that procured products and services conform to the requirements of the specifications. Requirements of these procedures shall be applied to lower-tier suppliers and/or subcontractors.

H. Nonconformances and Corrective Action: The QC Plan shall include procedures for handling of nonconformances. Nonconformances are defined as documentation, plans, material, equipment or work not conforming to the specified requirements. The procedure shall prevent nonconformances by identification, documentation, evaluation, separation, disposition and corrective action to prevent recurrence. Conditions having adverse effects on quality shall be promptly identified and reported to the senior level management. The cause of conditions adverse to quality shall be determined and documented and measures implemented to prevent recurrence.

I. Special Processes and Personnel Qualifications: The QC Plan shall include detailed procedures for the performance and control of special process such as, topsoil management, welding, soldering, heat treating, cleaning, plating, and nondestructive examination.

J. Personnel performing special process tasks shall have the experience, training and certifications commensurate with the scope, complexity, or nature of the activity. They shall be approved in writing by the Engineer before the start of work on the project.

K. Audits: The QC Plan shall provide for documented audits to verify that QC procedures are being fully implemented by the Contractor, as well as its Subcontractors. Audit records shall be made available to the Engineer upon request.

L. Documented Control/Quality Records: Establish methods for control of subcontract documents which describe how plans and specifications are received, and distributed to assure the correct issue of the document being used. The methods shall also describe how record data are documented and furnished to the Engineer.

1. Maintain evidence of activities affecting quality, including operating logs, records of inspections and tests, audit reports, material analyses, personnel qualification and certification records, procedures, and document review records.
2. Maintain quality records in a manner that provides for timely retrieval, and traceability. Protect quality records from deterioration, damage, or destruction.
3. Provide a list with specific records, as specified in the Contract Documents, which will be furnished to the Engineer at the completion of activities.

M. Acceptance of QC Plan: Engineer's review and acceptance of the QC Plan shall not relieve the Contractor from any of its obligations for the performance of the work. The Contractor's QC staffing is subject to the Engineer's review and continued acceptance. The Water Authority, at its sole option, without cause, may direct the Contractor to remove and replace the QC Representative. No work covered by the QC Plan shall start until Engineer's written acceptance of Contractor's QC Plan has been obtained.

N. Engineer may perform independent quality assurance audits to verify that actions specified in QC Plans have been implemented. No Engineer audit finding or report shall in any way relieve the Contractor from any requirements of this Contract.

1.10 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Quality Control Plan. Prepare and submit a Construction Quality Control Plan (CQCP) within 30 calendar days after receipt of the Notice of Award. The CQCP shall identify personnel, procedures, controls, instructions, tests, records, reports and forms to be used. Describe quality control for each work element. Submit as part of the Work Plan specified in Section 01120: Contractor Work Plan. Unless specifically authorized by the Engineer in writing, construction shall not be started and no requests for payment will be processed until the CQCP is approved. In addition to the meeting the QC Plan requirements the plan shall include:

1. Names and qualifications of personnel responsible for quality control on the Contract.
2. Area of responsibility and authority of each individual in the quality control system.
3. A description of the services the Contractor will have provided by outside organizations such as testing laboratories, manufacture representatives architects, and consulting engineers.
4. Procedures for reviewing shop drawings, samples, certificates, or other submittals for contract compliance, including the name of the person(s) authorized to sign the submittals for the Contractor, as complying with the Contract.
5. A test and inspection schedule, keyed to the construction schedule and following the order of the specification technical sections, indicating inspections and tests, the names of persons responsible for the inspection and testing for each segment of work, and the time schedule for each inspection and test.
6. The procedures for documenting quality control operation, inspection, and testing, with a copy of forms and reports to be used for this purpose. The Contractor shall also include a submittal status log listing submittals required by the specifications and drawings and stating the action required by the Contractor or the Engineer.

C. Independent Laboratory Qualifications. Name of the independent laboratory, a statement of qualifications (SOQ), the most recent certification by state/federal or other appropriate independent testing services, and names, resumes, and experience of the laboratory and field key personnel. Include a statement indicating the laboratory and field key personnel meet the requirements of this specification.

D. Daily and Weekly Quality Control Reports.

E. Quality Test Reports: Submit written test reports, engineering data and other documentation.

1. The independent testing firm retained by the Contractor for material testing shall submit three copies of each test report directly to the Engineer in a sealed envelope within two working days after each test is completed.
2. Consecutively number each report for each type of test. Summarize the report by material and/or operation type. Identify the tolerances as defined in the Contract Documents and indicate if the results meet or do not meet the Contract Document requirements.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 INSTALLATION

A. Inspection: Assist the Engineer with the inspection of materials or equipment upon the arrival on the jobsite and immediately before installation. Remove damaged and defective items from the jobsite.

B. Measurements: Verify measurements and dimensions of the work as an integral step of starting each installation.

C. Manufacturer's Instructions: Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.

END OF SECTION

SECTION 01500
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heating ventilation and air conditioning (HVAC), telephone service, water, and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, project signage, and water control.

C. Construction Facilities: Access roads, parking, field offices.

1.2 TEMPORARY ELECTRICITY

A. General

1. Provide all power for HVAC, lighting, operation of Contractor's plant or equipment, or for any other use by Contractor, and provide and maintain all temporary power lines required to perform the Work in a safe and satisfactory manner.
2. Provide temporary electric feeder and electrical service as required. Temporary connections for electricity are subject to approval of the Engineer and the power company representative.
3. Securely fasten in place and maintain all wiring for temporary electric power. All electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction and applicable local codes.
4. Pay for power service from utility sources and provide separate metering for cost of energy used as required.
5. Remove temporary electrical connections before final acceptance of the Work.

B. Qualification and Installation Requirements:

1. Install all materials and equipment in accordance with printed recommendations of the manufacturer.
2. Accomplish all work, including installation, connections, calibration, testing, and adjustments by qualified, experienced personnel working under continuous, competent supervision, reflecting adherence to prevailing codes, standards and methods. Coordinate installation in the field with other trades so that interferences are avoided.
3. Furnish adequate means for and fully protect all finished parts of the materials and equipment against damage from any cause during the progress of the Work. All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. All moving parts shall be kept clean and dry.
4. Replace or have refinished by the manufacturer all damaged materials or equipment, including face plates of panels and switchboard sections, at no additional cost to the Owner.
5. Perform testing and checkout work by qualified personnel skilled in the particular tests being conducted. Personnel are to have at least five years of

experience with tests of the same type and size as specified. Submit qualifications for all individuals that will perform testing to the Engineer at least 30 days before testing. Qualification statements shall clearly identify the individual's qualifications, and the specific tests that each individual is qualified to perform.

C. Jobsite Condition:

1. The site is supplied with commercial electrical power from the power company.
2. The commercial power supply may be interrupted due to impacts from others, such as brownouts or delays upgrading the commercial power;
3. If commercial power is used for the Work:

a. Coordinate directly with power company and verify the available capacity.
b. Do not interrupt or delay the Work if commercial power is not available.
c. Provide an Emergency Power Supply Plan defining the alternate power source if commercial power is interrupted.

D. Environmental Requirements:

1. Comply with all applicable site and environmental permits and restrictions.

1.3 TEMPORARY LIGHTING

A. Provide and maintain lighting for construction operations.

B. Provide suitable light for work conducted at night or under conditions of deficient daylight to insure proper work and to afford adequate facilities for inspection and safe working conditions.

C. Securely fasten in place and maintain all wiring for temporary electric light. All electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction and lo codes.

1.4 TEMPORARY TELEPHONE SERVICE

A. Provide and maintain at all times at the project site during the progress of the Work not less than one mobile telephone in good working order.

1.5 WATER SUPPLY

A. Provide an adequate supply of water of a quality suitable for its use, either domestic or construction.

B. The Contractor is solely responsible for the adequate functioning of its water supply system and shall be solely liable for any claims, delays or damages resulting from the use of same.

C. Furnish all drinking water on the site during construction. Post notices conspicuously throughout the site warning the Contractor's personnel that piped construction water is non-potable.

1.6 TEMPORARY SANITARY FACILITIES

A. Furnish temporary sanitary facilities at the site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project, including Engineer and Owner personnel.

B. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, unless otherwise required, furnish at least one toilet will be furnished for each 20 persons.

1.7 CONSTRUCTION AIDS

A. Furnish, install, maintain, and operate all construction aids required by Contractor and its Subcontractors in the performance of the Work. Such construction aids shall include, but not be limited to, the following:

1. Cranes and hoists
2. Temporary enclosures
3. Scaffolding
4. Temporary stairs
5. Drainage provisions

1.8 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

A. Protect, shore, brace, support, and maintain all underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by his construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, shall be restored to their original condition. All replacements shall be made with new materials.

B. Contractor is responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges, and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or workers to or from the Work or any part or site thereof, whether by him or his Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the Owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.

1.9 DAMAGE TO EXISTING PROPERTY

A. Contractor will be held responsible for any damage to existing structures, Work, materials, or equipment because of his operations and shall repair or replace any damaged structures, Work, materials, or equipment to the satisfaction of, and at no additional cost to, the Owner.

B. Contractor shall protect all existing structures and property from damage and shall provide bracing, shoring, or other work necessary for such protection.

1.10 BARRIERS AND FENCING

A. Provide barriers or fencing to protect adjacent properties from damage from construction operations and demolition.

B. Provide barriers around all excavations or obstructions to prevent accidents and protect Work, apparatus, equipment, and material from theft and accidental or other damages, and make good any damages thus occurring at no cost to the Owner.

C. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

D. Provide measures to protect Owner's personnel and public from Work activities including, but not limited to, safety fence surrounding the work and staging, storage and stockpile areas.

1.11 WATER CONTROL

A. Grade site to drain.

B. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from ponded or running water. Provide water barriers, as required, to protect site from soil erosion.

1.12 DUST CONTROL

A. Provide all labor, equipment, machinery and other means to control dust emissions throughout the site for the duration of the project.

B. Abate dust nuisance by cleaning, sprinkling with water or other means as necessary.

C. The use of water, in amounts which result in ponding, is not acceptable as a substitute for other methods.

1.13 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

1.14 SECURITY

A. Provide security and facilities to protect Work and Owner's operations from unauthorized entry, vandalism, or theft.

B. Contractor is responsible for protection of the site, and all Work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons.

C. No claim shall be made against the Owner by reason of any act of an employee or trespasser, and Contractor shall make good all damage to Owner's property resulting from his failure to provide security measures as specified.

D. Security measures shall be at least equal to those usually provided by the Owner to protect the existing facilities during normal operation, but shall also include such additional security fencing, barricades, lighting, and other measures as required to protect the site and the public.

E. Keep all Owner identified access gates locked except during the time when they are attended. Key privileges will be defined in the Preconstruction meeting.

1.15 ACCESS ROADS

A. Conduct work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, provide and maintain suitable and safe detours, or other temporary expedients for the accommodation of public and private travel.

B. As approved and based on the site location, construct and maintain temporary roads accessing public thoroughfares to serve construction area. Locations and methods of construction proposed for temporary access roads must be submitted for approval in the Contractor's work plan.

C. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.

D. Provide means of removing mud from vehicle wheels before entering streets.

1.16 PARKING

A. Provide and maintain suitable parking areas for the use of all construction workers and others performing work or furnishing services in connection with the Project, as required to avoid any need for parking personal vehicles where they may interfere with public traffic, Owner's operations, or construction activities. The location of the Contractor's parking areas shall be as acceptable to, and approved by, the Owner

1.17 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition. Brush clean or wash roadway near construction entrance(s) regularly.

B. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

C. Remove waste materials, debris, and rubbish from site and dispose off-site.

D. Maintain all construction areas and adjacent sites in a dust free condition.

E. Do not allow any condition to exist during construction which creates a nuisance; a fire hazard; an environment injurious to water quality, air quality, health or safety; or an attraction for children, animals, birds, rodents, etc.

F. Failure to comply with this provision after due and proper notice has been given by the Owner or representative will be sufficient grounds for the Owner to proceed to clean up such material and debris, make repairs and charge same to the Contractor.

1.18 PROJECT SIGNAGE AND CONTROLS

A. Provide signs along access roads to direct subcontractors, vendors etc to the construction site along approved access roads. At a minimum provide signs at all turn offs along access road(s).

1.19 CONTRACTOR'S FIELD OFFICE

A. During the performance of this Contract, maintain a suitable office at or near the site of the Work as the headquarters of Contractor's representative authorized to receive drawings, instructions, or other communication or articles. Any communication given to the Contractor's representative or delivered at the Contractor's office at the site of the Work in its absence shall be deemed to have been delivered to Contractor.

B. Keep Record Documents at the Contractor's office at the site of the Work and available for use at all times.

1.20 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, materials, when no longer required, and prior to Final Application for Payment inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction including all temporary connections and piping, and all affected improvements to their original condition, or better, to the satisfaction of the Engineer, Owner, and any other agency owning the affected utility

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01505
MOBILIZATION AND PREPARATORY WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. For the purposes of providing for expenses incidental to the initiation of construction and of discouraging unbalanced bidding, an item has been included in the bidding schedule to provide for payment for mobilization and preparatory work.

B. Mobilization and Preparatory Work includes, but is not limited to:

1. Obtaining all permits, SWPPP, licenses, bonds and insurance;
2. Moving all equipment, plant(s), equipment, material, subcontractors, incidentals, and personnel and to the site;
3. Necessary costs of acquisition of equipment, including purchase and mobilization expense;
4. Furnishing, erecting and removing temporary facilities including temporary construction power, lighting, and construction water supply;
5. Buildings, plants, and other temporary facilities at the project site;
6. Preparing and submitting Work Plans;
7. Protective measures including fencing for environmentally sensitive areas;
8. Providing and maintaining field offices for the Contractor;
9. Providing and maintaining field offices for the Engineer;
10. Security measures including installing and maintaining temporary fence, security gate(s) and signs;
11. Providing on-site sanitary facilities and potable water facilities;
12. Arranging and erecting Work and storage yard;
13. Posting all OSHA required notices and establishing safety programs;
14. Employing Project full time on-site Superintendent;
15. Preparing and submitting CPM Construction Schedule;
16. Preparing and submitting Schedule of Values;
17. Documenting the site and access conditions with photographs before starting and after completing the Work;
18. Construction surveying and staking;
19. Safety and temporary fencing;
20. Traffic control signage and barricades;
21. Demobilization and remobilization for winter shutdown;
22. Final demobilizing from the job-site; and
23. Any other work and operations that must be performed or costs that must be incurred incidental to the initiation of meaningful work at the site and for which payment is not otherwise provided for under this contract.
24. Attendance by Contractor staff and management of the preconstruction and weekly progress meetings.
25. Preparation and submittal of all documentation, drawings, product data, and other information as required by Specification Section 1330: Submittals.

C. All facilities, plant, and equipment that are established at, or brought to, the work site shall be deemed to be subject to the provisions of this Section, unless the Engineer specifically provides otherwise in writing for a particular item or items. The Contractor

is solely responsible for the adequacy, efficiency, use, protection, maintenance, repair, and preservation of all facilities, plant, and equipment. No facilities, plant, or equipment shall be dismantled or removed from the work site before completion of the work under the contract without the written permission of the Engineer.

D. All facilities, plant, and equipment on the work site are subject to Owner right to take possession of and utilize the same for the purposes of completion of the work should the Contractor's right to proceed be terminated. In addition, any encumbrance, lien, or other security interest on any such facilities, plant, or equipment shall be subordinated to the Owner's rights.

E. Payment for mobilization will be based on the Contractor's lump sum Schedule of Values breakdown submitted in accordance with Section 01200: Price and Payment Procedures. Mobilization will be an ongoing item throughout the duration of the Contract.

1.2 SUBMITTAL

A. Submit in accordance with Section 01330: Submittals.

B. Complete list of equipment proposed for the Work to include type, number of units, and any other data necessary to permit the Engineer to judge that adequate equipment shall be provided to complete the Work in a timely manner.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01515
RESERVOIR CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Control of reservoir level and outlet works operation during construction.

1.2 RESERVOIR CONTROL

A. The reservoir has been drained to the extent possible using the existing outlet works since April 2014 and will remained drained until construction is completed.

B. Under existing conditions, the reservoir is supplied by inflows from Juanita Reservoir (controlled upstream), and local precipitation. The Owner will operate upstream controls to not allow inflows from Juanita Reservoir during construction, and will keep the outlet works open to divert inflows from precipitation to the extent possible.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01550
CONSTRUCTION ACCESS ROADS AND PARKING AREAS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for construction access roads and parking areas.

1.2 GENERAL

A. Access to the construction area(s) shall be from the established entrance(s) off of Lands End Rd and Reeder Mesa Rd, west of the dam.

B. Contractor is responsible for all snow removal on site access roads when required for access to the Work and to furnish all required equipment and labor necessary to remove snow. Owner will only remove snow if and when necessary for Owner operations.

C. All construction traffic shall stay on approved construction access roads. Travel along other Owner identified roads is strictly prohibited.

D. Contractor is responsible for controlling dust emissions on all access site roads. Dust mitigation measures shall include at a minimum, control of vehicle speed on roads, and furnishing a water truck and operator for road dust control when required. Other dust mitigation measures such as palliatives may be considered and will require submittal and approval.

1. Concrete trucks
2. Material delivery trucks.
3. Equipment delivery trucks.

E. Obtain any applicable federal, state, or Local County permits for hauling on state, county, or local roads.

1.3 PROTECTION OF EXISTING ROADS

A. When legal load limits are exceeded, the Contractor may be fined by the County or State at no additional cost to the Owner. Repair damage to County or State roads caused by construction activity to meet the applicable County or State roadway standards.

B. Before using any existing roads for moving construction equipment or hauling materials and supplies to the site, the Contractor, Owner and Engineer will jointly perform a condition survey of roads in the vicinity of the project. Notify the Engineer at least 10 days in advance of hauling any equipment or materials to the site. A representative of the County may also be present for the condition survey.

C. Unless otherwise specified, Contractor is responsible for maintaining existing roads in their preconstruction condition until all construction activities are complete. Roads degraded by Contractor operations shall be repaired/regraded in a timely manner. At a minimum, the Contractor shall furnish a road grader and operator for road maintenance/repair when required.

1.4 CONSTRUCTION ACCESS ROADS

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area, with the Owner's approval and in accordance with all Federal, state, and local requirements.

B. Maintain public roadways free of mud and other construction debris. Install gravel tracking pad or other means to prevent tracking debris or mud onto public roads.

C. Extend and relocate as Work progress requires.

D. Construct, maintain, and reclaim temporary construction roads for access to borrow areas, and for other purposes required for the Work, in accordance with the requirements of the Specifications.

E. Indiscriminant construction of roads and travel will not be permitted.

1.5 PARKING

A. Provide temporary gravel surface parking areas at all field offices (Engineers, Contractor and new office building) and at Contractor use areas to accommodate construction personnel, as approved by the Engineer.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01555
STAGING AND STOCKPILE AREAS

PART 1 GENERAL

1.1 STAGING AND STOCKPILE AREAS

A. Establish Contractor and Engineer offices in the staging and stockpile areas shown on the Drawings and as approved by the Engineer.

B. Any clearing, grubbing, or grading in the staging and stockpile areas performed by the Contractor for setting up and maintaining this area requires the approval of the Engineer.

C. Strip and stockpile topsoil from the staging and stockpile areas in accordance with Section 02235: Stripping and Stockpiling.

D. Reclaim staging and stockpile areas in accordance with Section 02920: Seeding and Reclamation of Disturbed Areas.

E. Stockpile earthfill, topsoil, and other construction materials in the Contractor staging and stockpile areas as shown on the drawings or as approved by the Engineer.

F. Stockpiling of materials outside the limits of the Contractor staging and stockpile areas requires the approval of the Engineer.

1.2 SECURITY OF STAGING AND STOCKPILE AREAS

A. The Contractor is responsible for securing the staging and stockpile areas. Provide any security measures Contractor deems necessary to protect these work areas. All security fences and gates, if used by the Contractor, shall be removed by the Contractor at the end of construction.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01570
SEDIMENT AND EROSION CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnishing all labor, materials, equipment, and incidentals necessary to perform all installation, maintenance, removal, and cleanup related to erosion and sedimentation control work as specified herein and as required by local, state and federal regulations and permits to prevent erosion and/or transport of silt or sediment outside the limits of disturbance.

B. The work includes, but is not necessarily limited to, installation of temporary access ways and staging areas, silt fences and sediment barriers, sediment removal and disposal, device maintenance, removal of temporary devices, temporary stabilization, best management practices (BMPs), and final cleanup.

C. This section is intended to supplement erosion and sediment control measures specified and required by local, state and federal regulations and permits. Comply with the more stringent measures in the Section or as required by local, state and federal regulations and permits.

1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Technical product literature for all commercial products to be used for sedimentation and erosion control.

C. Contractors Sedimentation and Erosion Control Plan: A plan describing (BMPs) in accordance with local, state and federal regulations and permits and this Section, and Drawings, stamped and sealed by a professional engineer as required.

1.3 QUALITY ASSURANCE

A. The Contractor is responsible for the timely installation, maintenance, and removal of all sedimentation control devices necessary to prevent the movement of slurry or sediment from the construction site to offsite areas or into the reservoir or wetland system or preservation/ conservation areas via surface runoff or underground drainage systems. Measures, in addition to those shown on the Drawings, necessary to prevent the movement of sediment outside the limits of construction shall be installed, maintained, removed, and cleaned up at the expense of the Contractor. No additional charges to the Owner will be considered for the Work under this Section.

B. Conduct and sequence excavations and soil disturbing activities to minimize the risk of sediment transport downstream.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide sedimentation and erosion control products meeting the requirements of the Drawings, this Section, local, state, and federal regulations and permits requirements as applicable.

2.2 MATERIALS

A. Silt Fence:

1. Posts: 2-inch by 2-inch; 4 feet 6-inch long, wood stakes, suitably durable for driving without cracking, as approved by the Engineer.
2. Fabric: Woven, polypropylene, ultraviolet resistant material. Mirafi, Inc. Mirafi 100X, or approved equal.
3. Prefabricated commercial silt fence, if substituted for built-in-field fence: Mirafi Inc. "Envirofence", or approved equal.

B. Erosion Bales:

1. Certified weed hay or straw certified under the North American Weed Free Forage Certification Program, and New Mexico State University Seed Certification (NMSUSC) Program. Each certified weed free erosion bale shall be identified with purple and yellow twine, and regional Forage Certification Program tag indicating the Regional Forage Certification Program Number unless otherwise specified by the program:
2. Erosion bales shall be inspected for and Regionally Certified as weed free based on the Regionally Designated Noxious Weed and Undesirable Plant List. Do not unload certified weed free erosion bales or remove their identifying twine, wire or tags until the Engineer has inspected and accepted them. Provide a certificate of compliance showing the transit certificate number or a copy of the transit certificate as supplied from the forage producer.

C. Erosion Logs: Curled aspen wood excelsior with a consistent width of fibers evenly distributed throughout the log and a seamless casing comprised of a photodegradable tube netting. Fungus free, resin free and free of growth or germination inhibiting substances. Furnish logs with the minimum diameter and length shown on approved erosion and sediment control plans.

PART 3 EXECUTION

3.1 GENERAL SEDIMENT/EROSION CONTROLS

A. Install along the limits of disturbance, where shown on the Drawings, and where necessary to control erosion on slopes.

B. Provide additional sediment/erosion control barriers as needed to control the transport of silt and sediments outside of the limits of construction.

C. Install around the base of all soil stockpile areas.

D. Unless otherwise approved by the Engineer and allowed by local authorities, stabilize nonworking faces of soil stockpiles in place longer than three months, by mulching or other stabilization method acceptable to the Engineer.

3.2 INSTALLATION

A. Silt Fence:

1. Position as necessary to prevent movement of sediment produced by construction activities outside of the limits of construction or as approved.
2. Install pre-fabricated silt fence according to Manufacturer's instructions and approved erosion and sediment control plan details.

B. Hay Bale Barriers:

1. Provide either wire-bound or string-tied bales with the bindings oriented around the sides rather than over and under the bales.
2. Place bales lengthwise in a single row with the ends of adjacent bales tightly abutting one another.
3. Entrench and backfill bale barriers. Excavate trench the width of a bale and the length of the proposed barrier to a minimum depth of 4-inches. After bales are staked and chinked, backfill excavated soil against the barrier. Match backfill to the ground level on the downhill side and about 2 inches above the ground level against the uphill side.
4. Securely anchor each bale with at least two stakes or rebars driven through the bale deep enough into the ground to securely anchor the bales. Drive the first stake toward the previously laid bale to force the bales together.
5. Chink gaps between each bale (filled by wedging) with weed-free straw as necessary to prevent water from escaping between the bales.

C. Inlet Protection:

1. Install inlet protection for all catch basins, drop inlets, drop structures, inlets to drainage pipes, or other structures.

3.3 MAINTENANCE AND INSPECTIONS

A. Inspections:

1. Make a visual inspection of all devices at least once every 14 days and promptly after every rainstorm. If such inspection reveals that additional control measures or repairs are needed, promptly install necessary additional devices, or make repairs to prevent erosion and/or movement of sediment to areas outside the limits of construction.
2. Keep a log of all inspections indicating the following:

    a. Date and time of inspection
    b. Construction Project Inspector
    c. Amount of rainfall
    d. Erosion and sediment control devices inspected
    e. Condition of sediment and erosion control devices
    f. Repairs needed
    g. Date repair is completed

B. Minimum Device Maintenance:

1. Silt Fences:

a. Remove accumulated sediment once it builds up to one-half of the height of the fabric.
b. Replace damaged fabric, or patch with a 2-foot minimum overlap.
c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.

2. Hay bale Barriers:

a. Remove accumulated sediment once it builds up to one-half of the height of the hay bales.
b. Replace damaged hay bales.
c. Make other repairs as necessary to ensure that the hay bales are filtering all runoff directed to the barrier.

3. Inlet Protection:

a. Remove accumulated sediment once it builds up to one-half of the height of the barrier.
b. Remove all sediment accumulated within the barriers.
c. Make repairs as necessary to ensure that the inlet protection device is operating properly.

3.4 TEMPORARY STABILIZATION

A. The duration of the exposure of uncompleted construction to the elements shall be as short as practicable. Unless otherwise approved, permanently stabilize completed areas by seeding and mulching in accordance with Section 02920: Seeding and Reclamation of Disturbed Areas within seven calendar days after completion.

B. Temporarily stabilize disturbed areas where work is temporarily halted within seven days after the activity ceased unless work is to be resumed within 30 calendar days after the activity ceased. Temporary stabilization required by Contractor's negligence, or lack of proper scheduling, or for the convenience of the Contractor shall be at no cost to the Owner.

C. Temporary stabilization is defined as the covering of disturbed areas with seed, mulch, mulch with a tackifier, or a combination thereof. Temporary soil stabilization techniques shall be proposed by the Contractor and approved by the Engineer. Furnish temporary seed, if required, in accordance with Section 02920: Seeding and Reclamation of Disturbed Areas.

3.5 REMOVAL AND FINAL CLEANUP

A. Once the Site has been fully stabilized against erosion, and as acceptable to the Engineer, remove sediment control devices and all accumulated sediment. Dispose of sediment and waste materials in proper manner.

B. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings or specified herein.

END OF SECTION

SECTION 01575
DISPOSAL OF WASTE MATERIALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Classification of waste materials and disposal of waste materials.

1.2 CLASSIFICATION OF WASTE MATERIALS

A. Waste materials to be disposed of are classified in four categories: (1) excess excavated materials, (2) cleared vegetation, and (3) other waste materials

1. Excess excavated materials include only those soil and rock materials which are excavated from the designated excavations at the site which are not suitable for use in construction with or without processing, or in excess of that needed for construction as approved by the Engineer. Sediment from sediment and erosion control devices will also be considered excess excavated materials.
2. Excess cleared vegetation includes vegetation cleared from within the limits of site disturbance, from the staging and stockpile areas, borrow areas, and from temporary and permanent construction roads.
3. Other waste materials include, but are not limited to miscellaneous materials including, concrete, reinforcing steel, pipe, miscellaneous metalwork, wood, etc.; and contractor generated waste materials including but not limited to: petroleum products, solvents, paints and stains, refuse, garbage, debris, sanitary waste, crank case oil, grease, paint thinner, cleaning solvents or any other materials used by the Contractor for maintenance or operation of construction equipment that can be classified as controlled, regulated, or hazardous waste, and require special handling, storage, and disposal.

1.3 DISPOSAL OF MATERIALS

A. The following materials shall be disposed of at an off-site disposal facility:

1. Other waste materials described in this Section.

B. The following materials may be disposed of in the Owner-provided disposal area within one mile of the dam.

1. Excavated waste materials described in this Section.
2. Cleared vegetation described in this Section.

1.4 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Load receipts for materials disposed of at an offsite facility and other documentation as required by the Owner.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.1 OFF-SITE DISPOSAL OF WASTE MATERIALS

A. Remove waste materials from the construction area prior to the completion of the work. Dispose of waste materials designated for offsite disposal in an approved solid-waste facility or other approved facilities.

B. Make any necessary arrangements with private parties and with County officials pertinent to locations and regulations of area landfills. Pay any fees or charges required for off-site disposal of materials.

C. In the event that certain materials cannot be disposed of in the local waste disposal facility, identify a suitable alternative approved waste disposal facility and dispose of the material at such facility at no additional cost to the Owner.

3.2 ON-SITE DISPOSAL OF WASTE MATERIALS

A. Excavated waste materials and cleared vegetation may be disposed of in Owner-provided disposal areas provided placement methods comply with the provisions specified herein.

B. Scarify surfaces to create bonding between ground and placed material. Place excavated waste material in maximum 12-inch loose lifts, moisture condition the material to near optimum as accepted by the Engineer, and compact each lift with a minimum of 4 coverages of a D-6 or larger bulldozer or suitable roller as approved by the Engineer.

C. Place cleared and grubbed materials in areas of the disposal area as approved by the Owner and cover with minimum 12 inches of soil

D. Grade and shape the waste placement area to match surrounding grade and such that existing drainage patterns are maintained and there are no areas that would pond water.

END OF SECTION

SECTION 01720
LAYOUT OF WORK AND SURVEYING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section covers surveying requirements.

1.2 GENERAL

A. The Engineer will identify existing site reference points and baselines as shown on the Drawings.

B. Provide all materials, items, operations or methods specified, listed or scheduled in specifications and drawings, including all materials, labor, equipment and incidentals necessary and required to conduct proper surveys required to stake and layout the Work.

C. Conduct all surveys for the Work including checking existing survey control reference point locations and elevations; reestablishing construction control, resetting of stakes and monuments, measurement for payment of completed work, and performing surveys needed for restoration of public and private improvements that have been damaged, destroyed, or relocated by Contractor.

D. Conduct all surveys and staking under the responsible charge of a Professional Land Surveyor (PLS) properly licensed in the State where the project is located.

E. The surveyor performing the on site construction staking shall have a minimum of 5 years of construction staking experience.

F. The cost to the Contractor of all work and delays occasioned by giving lines and grades, or making other necessary surveys and measurements, are considered as having been included in the unit and lump sum prices for items of Work.

G. Make available to Engineer for examination all field books, notes, and other data developed by Contractor in performing surveys required as part of the Work throughout the construction period. Submit such data to the Engineer on request, and with the other documentation required for final acceptance of the Work.

H. Keep neat and legible notes of measurements and calculations made in connection with the layout of the Work and measurement and payment. Submit copies of such data to the Engineer for use in checking Contractor's layout and measurement and payment.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Qualifications:

1. Resume detailing the experience level of the PLS for review 10 days prior to the start of any surveying activities. Include Telephone Number, Address, Qualifications, and License.
2. Resume of staking surveyor if different than PLS above.

C. Survey Control Plan: Surveyor plan to conduct surveys using the control points established and shown on the Drawings. As the work progresses, submit all subsequent changes to the survey control plan.

D. A certificate signed by the PLS, stating that the elevations and locations of the Work are in conformance with Contract Documents shall be submitted at Contract closeout.

E. Survey Records: After a survey is conducted, submit survey data and field notes to the Engineer. Electronic data (drawings in AutoCAD-compatible .DWG format and data in ASCII format) also shall be submitted.

1.4 PROJECT PRIMARY SURVEY CONTROL

A. Horizontal and vertical primary survey control for the project consists of existing benchmark reference points shown on the Drawings.

B. Check the position of the reference points comprising the primary control prior to starting site work and notify Engineer of discrepancies found between actual and record measurements.

C. Do not disturb existing reference points without prior written approval from the Engineer. If existing reference points are disturbed during construction, install and establish new replacement reference points as an equal replacement for survey control as approved by the Engineer. Submit the locations of the new or replacement reference points for Engineer approval before establishing as reference points.

D. Protect reference points. Replace damaged reference points at no additional cost to the Owner.

1.5 SECONDARY CONTROL

A. From the primary reference control provided by Engineer, establish secondary control points as necessary for the construction of the Work. Secondary control shall consist of sufficient permanent points to establish the lines and grades for the various Work either directly or by offset. Establish layout lines for use in construction of the Work taken directly from either the primary or secondary controls.

B. Tie to and close secondary controls with the primary controls.

1.6 ACCURACY OF SURVEYS

A. Locate points for cross sections to the nearest 0.05 foot horizontally and vertically.

B. Close vertical elevation surveys within 0.05 foot times the square root of the length of the circuit in miles.

C. Set grade stakes to 0.02 feet.

D. Alignment of tangents and curves shall be within 0.01 foot.

E. Set points for structures to the nearest 0.02 foot, except where the operational function of special features require closer tolerances.

F. Survey any movement monuments within an accuracy of 0.01 foot vertical and 0.01 foot horizontal.

G. Tolerances for all other Work: As shown or specified in the Contract Documents.

H. Furnish accurate survey instruments. Survey instruments are subject to inspection by Engineer for proper operation.

1. Check calibration of electronic distance measuring (EDM) instruments a minimum of once per month on an established base line approved by Engineer. Keep calibration results in a log book, available Engineer's review, showing the date and distances measured on the base line. Do not use an EDM if it does not meet the minimum advertised accuracy published by the manufacturer of the EDM.
2. Conduct a zero baseline test on Global Positioning System (GPS) equipment. A zero baseline test is a test on two or more receivers simultaneously gathering data from one antenna with data post processed to give a resulting vector between the receivers that is equal to zero.
3. Promptly replace, repair, or adjust defective survey instruments to operate within the tolerances of the instrument manufacturer.

I. Remove and replace all work not surveyed with the methods and equipment as submitted by Contractor and accepted by Engineer at no additional cost to the Owner.

1.7 PROTECTION OF MONUMENTS, STAKES, AND MARKS

A. Preserve and protect all survey monuments and related marks. When removal is necessary, accurately reference the monuments or related marks, subject to the approval of Engineer.

1. Replace and reset all survey stakes, control points, monuments, benchmark, or reference stakes disturbed or destroyed during the work to the satisfaction of Engineer at no additional cost to the Owner.
2. Reset primary or secondary control monuments removed as soon as the Work requiring the removal is complete. Alternatively, set other control points so as to reestablish the control network.
3. Recheck the position of monuments, control points, or other marks that are subject to movement due to the passage of equipment or other forces at regular intervals, but not less than monthly.

1.8 QUANTITY SURVEYS

A. Following the completion of all the clearing and grubbing operations in an area, and before commencing topsoil or other stripping, prepare a baseline survey consisting of, at a minimum, cross-sections at 50-foot intervals, and additional points as necessary to represent the surface accurately in all areas of disturbance as a basis for determining excavation.

B. Conduct a cross section survey meeting the same requirements as the baseline survey after excavation is complete and any time before fill placement. Calculate and submit excavation and fill quantities by either the average end area method or by using digital terrain models.

C. If a material is specified to be measured in a stockpile, conduct the baseline survey on the ground surface before stockpiling the material, and a survey of stockpiled material.

D. Each month, determine the volume of excavation and fill using the established baseline survey cross-sections.

E. At the point where the Work performed under a bid item is completed, perform a final cross section survey meeting the same requirements as the baseline survey to calculate quantities (as described above).

F. The difference in calculated quantities between the initial and final cross-sections or digital terrain models for each item will be the basis for the total payment to Contractor for that item unless otherwise defined in the specifications. Submit a copy of cross-section survey data and quantity calculations to Engineer with each monthly payment.

G. The Engineer or Owner may perform check surveys in selected locations to verify measurements and quantities. Provide the Owner and Engineer access to the Work areas for survey measurements, as required.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 REQUIRED SURVEYS

A. Surveys listed below are the minimum survey requirements. Whether listed or not Contractor is responsible to provide all surveys necessary for control, construction, and to provide complete as-constructed information for record documents and record drawings.

B. Quantity surveys for payment.

C. Surveys required for establishing and maintaining survey control.

D. Surveys required for construction to plan elevation and locations, including staking.

E. Surveys for project boundaries, including easements, right of ways, and disturbance limits.

F. Surveys of existing structures, including structure and pipe inverts and elevations required to confirm, coordinate and attach existing work to new construction. Complete surveys as soon as features previously submerged, buried, or covered become accessible.

G. As-constructed surveys of new construction, including, but not limited to:

1. New concrete structures including all vertical and horizontal corners.
2. Pipe inverts, alignments, and connection points.
3. Regraded and disturbed areas.
4. New instrumentation.

END OF SECTION

SECTION 01770
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Project record documents.

1.2 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.

B. Provide submittals to Engineer that are required by governing or other authorities.

C. Submit Final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.3 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Remove temporary site facilities and utilities.

C. Remove waste and surplus construction materials, rubbish, wood, concrete, debris, other foreign material, excess material, and construction facilities from the site.

1.4 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other Modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Specifications: Legibly mark and record, at each Product section, description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and Modifications.

E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Field changes of dimension and detail.
2. Details not shown on original Contract Drawings.

F. Submit documents to Engineer with request for Final Application for Payment.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

DIVISION 2 – SITE WORK

SECTION 02090
PIPE VIDEO INSPECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This Section covers requirements for conducting video inspections of toe drain piping.

1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Qualifications of video inspection firm and proposed video inspection and recording equipment.

C. Three compact DVDs with the video of pipe inspection.

D. One copy of all field notes taken by the pipeline inspectors.

1.3 COORDINATION

A. Coordinate video inspection of pipes so the Engineer may be present. Notify the Engineer a minimum of 48 hours before the inspection is to be conducted.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 VIDEO INSPECTION

A. Record single frames of video images and live video as well as inspection data onto a CD/DVD.

B. Video Pipe Inspection Equipment:

1. Video Camera: Conduct video inspection using a camera mounted on a remotely operated crawler or on push type cable. Provide the following:

   a. Sufficient brightness to clearly illuminate the inside of the pipe.

   b. Capability of viewing a minimum of 270 degrees around the pipe perimeter.

   c. Capability to locate the vertical and horizontal camera position from the surface.

2. Video Recording Equipment.

   a. Video monitor for viewing real-time video footage, along with recording capabilities.

   b. Capability to record distance of camera location superimposed on the video image.

   c. Capability to record pipe inspection video on color video in DVD format. Provide the ability for any captured video to be played back from a CD/DVD by any user with a PC utilizing standard viewers.

C. Setup video monitor in a location for viewing by the Engineer. Provide shrouds or other light blocking so the video monitor is clearly visible.

D. Begin video recording as soon the crawler unit/camera unit is inserted into the pipe continuing to the end of the available pipe that can be videoed.

E. Record on video images the distance inside the existing host pipe and the time and date of the inspection.

F. Provide an audio voice with the video that includes a description of obstructions and anomalies or obstructions. Zoom and pause at anomalies when directed by the Engineer. Draw attention to all recognizable defects and imperfections on the video. Record on written notes locations of any defects.

G. Submit the video inspection within 1 day of inspection. The CD/DVD becomes the property of the Owner.

END OF SECTION

SECTION 02220
SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section includes requirements for selective demolition, removal and salvage, and removal, relocation and reinstallation of existing project features where shown on the Drawings. The approximate location and dimensions of the principal structures to be demolished are noted on the Drawings. In general, minor and appurtenant structures are not shown.

1.2 DEFINITIONS

A. Demolish, Demolition, or Remove: Remove and dispose of designated existing equipment, materials, and ancillary features and components.

B. Remove and Salvage: Remove and deliver existing equipment, materials, and ancillary features and components to Owner at location as directed.

C. Remove and Relocate: Remove and relocate equipment, materials, and ancillary features and components.

D. Reinstall: Make service connections, and provide functional equipment at designated new location.

E. Retain or Protect: Leave designated existing equipment, materials, and ancillary features and components in place and protect from damage.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Demolition Plan: Procedures proposed for selective demolition, salvage and relocations of the items listed in this section and shown on the Drawings. Identify procedures for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property that is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. Include:

1. Sequence and schedule, including removals, salvage and replacement.
2. Detailed description of the methods and equipment to be used for demolition, removals, salvage, and replacements.
3. Proposed methods of dustproof and weatherproof partitions and closures to be used when required.

C. Permits: Copies of current valid permits and licenses where required by state and local regulations.

D. After demolition is complete, if requested by the Engineer, submit reports describing quantities and type of demolition materials, and the locations, quantity, and method of disposal.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. The extent of demolition work shown on the Drawings is based on record Drawings and site observations. The specific extent of demolition for the various items will be determined by the Engineer in the field.

B. Notify Owner and Engineer minimum 7 days prior to beginning demolition work.

C. Protect existing vegetation, facilities, equipment, and fixtures to remain.

D. Remove concrete, material and structures, as required, in a manner to prevent interference with the Owner's operation and maintenance of the Project, and to prevent damage or structural instability/weakness to adjacent structures and equipment.

E. Provide temporary barricades and other protection as required.

F. Erect and maintain dustproof and weatherproof partitions and closures as required.

G. Provide required shoring, bracing, and supports.

H. Equipment and Materials Designated for Salvage:

1. Do not remove and salvage features and materials without approval of Engineer.
2. Store and maintain salvaged equipment and materials in same condition as when removed.

I. Contractor and Engineer will document and record the condition of features and materials prior to removal.

3.2 DEMOLITION

A. Remove items to be demolished to limits noted on Drawings.

B. Conduct demolition operations and debris removal in a manner ensuring minimum interference with roads, structures, and other adjacent features and facilities.

C. Immediately notify the Engineer of damage to structures and features not identified for demolition or beyond the limits of demolition shown on the Drawings or as identified by the Engineer.

D. Repair or replace damage to existing features beyond the limits of demolition using materials and methods appropriate for the particular location, as approved by the Engineer, at no additional cost to the Owner.

E. Remove materials to conform to new elevations, profiles, and sizes. Comply with specified tolerances and finishes.

F. Saw cut or otherwise isolate materials to be removed to minimize damage to adjacent surfaces.

G. Remove concrete in small sections.

H. Use water sprinkling, temporary enclosures, and other methods to limit dust. Indiscriminate production or blowing of dust will not be allowed. Submit a plan for dust control, as part of the demolition plan indicated herein, before starting the work.

I. Saw Cutting:

1. Cut openings in concrete structures with full-depth saw cut edges and core drill corners to prevent over-cutting.
2. Saw cut asphalt pavement at removal ends.

J. Assume all concrete to be demolished contains steel reinforcement.

1. Where concrete faces leave the ends of reinforcement exposed, protect reinforcement ends from corrosion using one of the following methods as approved by the Engineer:

   a. Cut back reinforcing steel to a minimum of one inch below concrete face and patch in accordance with Section 03930: Concrete Repair.
   b. Coat exposed ends of reinforcement with approved epoxy paint.

2. Repair damaged concrete surfaces as directed by the Engineer

K. Comply with provisions of Section 01575: Disposal of Waste Materials for disposal of removed items, demolished materials, and debris.

L. Blasting is not allowed for demolition.

END OF SECTION

SECTION 02230
CLEARING AND GRUBBING

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Removal of all surface debris, grass, trees, and shrubs from the disturbance limits indicated on the Drawings, and as required to perform the work.

B. The general work areas which require site clearing include, but are not limited to:

1. Contractor staging and stockpile areas.
2. Borrow areas.
3. Access roads where shown.

1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Clearing and Grubbing Plan:

1. Describe method for vegetation removal and disposal.
2. Describe temporary barriers and methods to protect existing structures and property, existing plant life and features designated to remain, and areas beyond limits of disturbance as identified on the Drawings.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 PROTECTION

A. Protect and preserve in place all trees, plants, lawns, structures, and other improvements that are specifically designated on the Drawings as wetlands or otherwise to be preserved, or are not required to be removed for the performance of the Work, see also Section 01350: Environmental Protection.

B. Verify with the Engineer the area to be cleared and existing plant life and features designated to remain or be protected before initiating any clearing operations in that area.

C. Unauthorized clearing will not be approved for payment, and the Contractor is responsible for replacement of damaged existing plant life and features designated to remain.

D. Flag, barricade, and clearly mark existing plant life, environmentally sensitive areas, and features designated to remain. Maintain fencing and flagging in good condition for the duration of the Work.

E. Conduct clearing and grubbing operations in a manner that will preserve and protect vegetation beyond the limits of clearing and grubbing. Protect any trees, plant growth,

and site features not designated for removal or designated for protection. Remove only those trees and plant growth required for the Work.

F. Do not disturb trees or shrubbery in public right-of-way or on property outside of the limits of disturbance shown on the Drawings.

3.2 CLEARING AND GRUBBING

A. Remove all trees, shrubs, undergrowth, deadwood, and other surface debris as required to perform the Work, within the limits of disturbance shown on the Drawings, except for those trees and shrubs designated to be protected.

B. Clear and grub only the areas to be disturbed by proposed facilities and grading: excavations, embankments, structures, slabs, and roadways.

C. Remove all trees, stumps, branches, brush and other material from clearing and grubbing activities. Cut tree trunks and branches into 10-foot maximum lengths and stockpile in staging and stockpile areas designated on the Drawings.

D. Remove and stockpile topsoil in accordance with Section 02235: Stripping and Stockpiling Topsoil.

E. Do not leave logs, stumps, rocks, etc., lying in the public right-of-way or on adjacent property without written approval by the Engineer.

3.3 DAMAGED VEGETATION

A. Contractor is responsible for injuries to vegetation caused by Contractor operations, personnel, or equipment. Remove and replace damaged vegetation designated for protection with vegetation of same type and size at no additional cost to the Owner.

3.4 PLACEMENT AND DISPOSAL

A. Dispose of excess vegetative materials and debris materials in accordance with all applicable rules and laws and in accordance with the requirements of Section 01575: Disposal of Waste Materials.

3.5 MAINTENANCE OF CLEARED AREAS

A. Maintain cleared work areas in a condition free from additional vegetation growth for the duration of the project.

B. See Section 02920: Seeding and Reclamation of Disturbed Areas and the Project Noxious Weed Control Program where applicable regarding the use of herbicides.

C. Compensation for clearing each area will occur only one time. If weeds and brush growth require additional clearing, this shall be performed solely at the Contractor’s expense.

END OF SECTION

SECTION 02235
STRIPPING AND STOCKPILING TOPSOIL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This Section covers requirements for stripping topsoil within the limits of site disturbance as shown on the Drawings; and for stockpiling topsoil.

1.2 DEFINITIONS

A. Topsoil – Topsoil stripped from the site shall be the top surface soil that is dark brown or black, fertile, and contains organic matter or the soil that is located within 6 inches of the surface, or as directed by the Engineer. Topsoil shall be free of subsoil, noxious weed seed or reproductive vegetation plants, heavy clay, hard clods, toxic substances or other material which would be detrimental to plant growth.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL

A. Excavate topsoil from areas requiring stripping, as indicated on the Drawings or as directed by the Engineer.

B. Remove roots larger than 1 inch, rocks larger than 3 inches, and debris prior to stockpiling of the topsoil, unless determined otherwise by the Engineer. Existing grass layers may be mulched, crushed and incorporated into topsoil provided the layers are mixed adequately into the topsoil stockpiles.

C. Do not contaminate topsoil with other excavated materials.

D. Stockpile topsoil in area(s) designated on the Drawings or other approved locations. Keep topsoil stockpiles separate from other excavated materials.

E. Install erosion protection around all stockpiles. Protect topsoil stockpiles from wind and water erosion. Grade and smooth stockpile surface to prevent water accumulation from storms.

F. Do not allow weed growth on salvaged topsoil stockpiles. Remove and dispose offsite any weed growth before weeds produce mature seed heads.

G. If the Contractor fails to perform topsoil salvaging, or if the quantity of topsoil salvaged does not equal the quantity of topsoil available for salvaging due to improper removal, storage or maintenance of stockpiles, import additional topsoil in quantities sufficient to meet the topsoil deficit as determined by the Engineer at no additional cost to the Owner.

END OF SECTION

SECTION 02240
DEWATERING AND DIVERSION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all material, equipment, and labor to install and maintain all pumps, piping, drains, well points, wells, temporary channels, detention ponds, and dams and other facilities required to effectively control, collect, and dispose of groundwater or surface water to permit safe and proper completion of the Work. Use appropriate equipment and methods for dewatering based on existing site conditions.

B. Provide observation wells as necessary to verify satisfactory performance of the dewatering system.

C. Maintain the foundations and other portions of the Work free from water as required for constructing each part of the Work.

D. Comply with all applicable environmental protection laws and requirements in operation of the dewatering system.

E. Remove all components of the dewatering system after it is no longer required.

1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Dewatering and Diversion Plan: Submit a Dewatering and Diversion Plan prepared by a qualified dewatering specialist, with at least 10 years of experience in design, installation, and operation of dewatering installations. Unless otherwise waived by the Engineer, the Dewatering Plan shall be prepared by a Licensed Professional Engineer in the State of Colorado and include the following:

1. Details regarding the anticipated types and locations of various dewatering facilities, proposed number and locations of observation wells, and design calculations required substantiating the Dewatering Plan.
2. Superintendence plan and schedule, indicating who will be responsible for observing the dewatering system and the proposed schedule describing when personnel will be on site to observe and maintain the system.
3. Proposed locations, depths, and construction details of observation wells. Data from these wells shall be used as appropriate, along with other available information, to modify dewatering requirements.
4. Coordination with other work including schedule, dewatering and diversion methods and operations, erosion and sediment control measures, equipment, and location and elevation of pumps, pipes, and any other features planned for use in the dewatering plan
5. Final recommendations for dewatering.
6. If the Contractor purchases, rents, installs, or mobilizes to the site any elements of the dewatering system before approval of the dewatering submittal, the Contractor does so at its own risk, and will not be due any additional

compensation from the Owner if such elements are not subsequently used for the work.

7. Approval of the dewatering system proposed by the Contractor will only be with respect to the basic principles of the methods the Contractor intends to employ. Approval does not relieve the Contractor of full responsibility for adequacy of the dewatering system.

1.3 DEFINITIONS

A. Definitions

1. Dewatering: Removing water by single or multiple stage well points, deep wells, ejector wells or sumps, as approved based on the Contractor's submittals.
2. Hydrostatic Groundwater Level: The groundwater level at any location during construction and before dewatering.
3. Observation Well: Temporary well to observe dewatering system performance during construction.
4. Sump: A depression excavated or constructed, from which water is pumped as part of dewatering.

1.4 AVAILABLE DATA

A. Logs of test borings and groundwater observations at the time of drilling are included on the Drawings and Baseline Report.

B. The Contractor may refer to the boring and test pit logs on the Drawings, but shall draw their own conclusions as to the applicability of the information contained therein. The Contractor may choose to perform additional investigations to develop their dewatering plan. It is the Contractor's responsibility to evaluate site subsurface conditions with respect to required dewatering facilities.

C. The subsurface conditions and groundwater observations from the test pits and borings apply only to the locations of the test pits and borings and at the time of the explorations and measurements. The subsurface conditions at the site may be different at the time of construction as compared to when observations were made and recorded, and the groundwater level can be expected to fluctuate. These factors should be appropriately considered in developing the Contractor's Dewatering Plan.

1.5 QUALITY ASSURANCE AND QUALITY CONTROL

A. Dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the Contractor.

PART 2 PRODUCTS

2.1 DEWATERING SYSTEM

A. The dewatering system shall be well-points or sumps that fulfill the dewatering requirements specified in this Section. The materials and construction of the dewatering wells will be selected by the Contractor and the Contractors' dewatering specialist.

PART 3 EXECUTION

3.1 GENERAL

A. Design, furnish, install, maintain, and operate a dewatering system that prevents loss of fines, boiling, quick conditions, or softening of foundation strata and maintain stability of bottom of excavations so that every phase of the work can be performed in the dry. Operate dewatering systems such that excavation bottoms are firm, suitably dry, and free from standing water at all times. Provide the number of observations wells as approved in the Dewatering Plan.

B. Verify lowering of the groundwater level a minimum of 2 feet below the excavation bottom by observation well readings before commencement of excavation below the hydrostatic groundwater level.

C. Locate elements of the dewatering system such that interference with excavation and construction activity is minimized. Locations are subject to approval by the Engineer.

D. At all times during construction, provide ample means and devices to remove promptly, and dispose of properly, all water entering excavations and keep the bottoms of excavations firm and free of standing water until structures to be built thereon are completed and/or backfill to be placed therein is placed. Conduct pumping and dewatering operations such that no disturbance to foundation subgrade materials or to fill materials supporting any other work will result. Discharged water shall be piped to an approved area.

E. Install silt barriers or other discharge control measures at dewatering discharge locations, to control and prevent siltation. Provide suitable discharge controls in accordance with applicable federal, state, and local permit regulations, and Section 01570: Sediment and Erosion Control. Do not allow dewatering discharge to cause siltation or other negative environmental impact on natural waterways or other property.

3.2 INSTALLATION AND OPERATION

A. Before any excavation deeper than 2 feet above the hydrostatic groundwater level, operate the dewatering system to lower water levels as required and then operate continuously 24 hours per day, 7 days per week until all facilities and structures affected by the dewatering have been satisfactorily constructed, including placement of fill materials to an elevation at least 2 feet above the hydrostatic groundwater level.

B. Maintain groundwater levels low enough to fulfill the requirements of this Section and do not allow the water level to rise until constructed facilities are complete, so that the water can be allowed to rise without damaging facilities, their foundations, or surrounding areas and structures.

C. Provide superintendence in accordance with the approved plan during all periods of dewatering. Superintendence means providing qualified Contractor personnel knowledgeable in operation and maintenance of dewatering system(s). The Contractor is responsible for any damage resulting from failure to maintain the dewatering system.

D. Provide complete standby equipment and power sources available for immediate operation as may be required, to adequately maintain the dewatering on a continuous basis in the event that all or any part of the dewatering system becomes inadequate or

fails. Provide an automatic switchover system to the standby power source to ensure uninterrupted power supply to pumps in an emergency. Spare pumps shall be automatically engaged if primary pumps fail for any reason.

E. When the dewatering system does not meet the specified requirements, and as a consequence, loosening or disturbance of the foundations strata, instability of the slopes, or damage to the foundations or structures occurs, the Contractor is responsible for supplying all materials and labor and performing all work for restoring foundation soils, slopes, foundations, and structures, to the satisfaction of the Engineer, and at no additional cost to the Owner.

F. When failure to provide adequate dewatering and drainage causes disturbance of the soils below design foundation or excavation grade, provide adequate dewatering and excavate and re-fill the disturbed areas with approved, properly compacted fill material. Such work shall be at the Contractor's expense and at no additional cost to the Owner.

3.3 SURFACE WATER

A. Construct and maintain any temporary channels, detention ponds, and dams to control, route surface water and storm water away from the Work.

B. Control surface water in a manner that prevents damage to any constructed items, items being constructed, or any neighboring structures or facilities.

C. Prevent sediment transport onto to downstream or adjacent properties.

3.4 REMOVAL

A. Obtain written approval from the Engineer before discontinuing operation of any portion of the dewatering and diversion system(s).

B. Remove all elements of the dewatering and diversion system(s) and observation wells from the site at the completion of dewatering work.

C. Abandon observation wells by removing casing and backfilling holes with approved cement grout.

END OF SECTION

SECTION 02280
PIEZOMETER ABANDONMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piezometer abandonment.

1.2 DEFINITIONS

A. Abandonment: Removing piezometers no longer intended for use by plugging and sealing in accordance with applicable regulations.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Permits, Licenses, and Certificates: Copies of permits, licenses, certifications, inspection reports, records, and similar documents established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

C. Piezometer Abandonment:

1. Qualifications of the licensed drilling contractor to perform abandonment and qualifications of geologist or geotechnical engineer hired by the Contractor and approved by the Engineer to inspect and approve the abandonment.
2. Abandonment materials including cement-bentonite grout, and equipment.
3. Abandonment procedures plan.
4. Abandonment Report including measured depth of piezometer and water, and quantities of abandonment materials used for abandonment of each piezometer.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. Document and record the condition of piezometers before abandonment. Inform Engineer a minimum of 48 hours in advance of abandoning any piezometer.

3.2 PIEZOMETER ABANDONMENT:

A. Abandon existing piezometers shown on the Drawings. Comply with all applicable State rules and regulations regarding abandonment of piezometers.

B. Grout the piezometers with cement-bentonite grout using tremie grouting methods. Completely fill the pipe with grout and top off the hole with additional grout after any shrinkage occurs.

C. Using casing removal procedures where required by permit.

D. Cutoff the PVC pipe that protrudes above the excavated or finished ground surface.

E. Submit a well abandonment report to the Engineer indicating type and quantity materials and procedures used for abandonment.

END OF SECTION

SECTION 02315
EXCAVATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Required site excavations as shown on the Drawings.

1.2 WORK NOT INCLUDED IN THIS SECTION

A. Work associated with clearing and grubbing or stripping and stockpiling topsoil are not considered as excavation and shall be performed in accordance with Section 02230: Clearing and Grubbing and Section 02235: Stripping and Stockpiling Topsoil.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Proposed excavation plan at least 14 calendar days prior to performing any excavations. Include: Proposed excavation method(s) to be used; proposed excavation slopes, trench shields, bracing or other methods of construction to complete the construction safely; proposed excavation equipment; and proposed excavation sequence. Combine the excavation plan submittal in the Earthwork Plan required in Section 02330: Fill.

1.4 EXCAVATED MATERIALS CLASSIFICATION

A. All excavations are considered unclassified.

1.5 PROTECTION

A. Comply with all safety requirements of OSHA.

B. Protect existing structures and facilities to remain. Damage to existing structures and facilities by the Contractor shall be repaired by the Contractor at no cost to the Owner and to the satisfaction of the Engineer

1.6 EXISTING SITE CONDITIONS

A. Use equipment and methods appropriate for site conditions.

B. Exploratory investigations cannot be relied on to accurately characterize all conditions that may exist in the foundations and that may be encountered during construction. Therefore, final excavated lines and grades will be determined in the field by the Engineer.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL EXCAVATION REQUIREMENTS

A. Identify required excavation lines, levels, contours, and datum, as shown on the Drawings.

B. Verify locations of buried underground utilities and pipes and overhead utilities prior to excavations. Notify local utility location service to verify location of underground utilities prior to excavating. Provide documentation of utility locations to the Engineer at least 24 hours prior to excavating. Immediately notify the Engineer if underground utilities or other unexpected underground structures are encountered. Repair any utilities or pipes damaged during construction at no cost to the Owner.

C. Excavate to the lines and grades as shown on the Drawings.

D. Repair damage to the work caused by the Contractor's operations including disturbance of the material beyond the required excavation at no additional cost to the Owner. Make repairs in accordance with this section as directed by the Engineer, and at no additional cost to the Owner.

E. Assume all responsibility for determinations as to the nature of the materials to be excavated and the difficulties of making and maintaining the required excavations.

F. The Engineer reserves the right, during the progress of the Work, to vary the slopes, grades, or the dimensions of the excavations from those specified herein. Where the Engineer determines that foundation material is unsuitable through no fault of the Contractor, additional excavation will be ordered in writing and payment will be made in accordance with Section 01200: Price and Payment Procedures.

G. Take all necessary precautions to preserve the material below and beyond the established lines of all excavation. Repair any damage to the Work or the foundations as a result of the Contractor's operations as directed by the Engineer at the expense of and by the Contractor.

H. Unless authorized in writing by the Engineer, all excavations shall be in the dry and dewatered in accordance with Section 02240: Dewatering.

I. Do not excavate in frozen materials, except with written approval of the Engineer.

J. Side slopes of all earth excavations shall be no steeper than that shown on the Drawings. In all cases, excavations shall conform with all safety requirements of OSHA.

K. Notify the Engineer as soon as possible of any unusual soil conditions, soil conditions that vary from test borings, or soils of questionable stability or bearing capacity.

L. Dispose of excavated materials which are excess or deemed unsuitable. Dispose of unsuitable/excess excavated materials in accordance with Section 01575: Disposal of Waste Materials.

M. Do not waste any excavated material without the approval of the Engineer.

N. Excavated material will not be judged “unsuitable” due to moisture content alone.

O. If slumping, heaving, or any other evidence of instability is observed during excavation, immediately report evidence of instability to the Engineer, whether it is observed during working or non-working hours.

P. Be prepared to temporarily backfill any unstable excavation to stabilize the area, if directed to do so by the Engineer.

3.2 EXCAVATED MATERIAL SUITABLE FOR FILL

A. Stockpile excavated materials that are acceptable for use as fill materials. Suitability of excavated material shall be based on specified material requirements in Section 02330: Earthwork.

B. Transport excavated materials suitable for use as fill to designated (or mutually agreeable) stockpile areas.

C. Condition and re-use suitable materials from required excavations in the permanent construction as directed by Engineer.

D. Perform operations so that the excavations will yield as much suitable material for construction purposes as practicable.

E. Separate suitable materials for construction purposes from materials to be wasted; and minimize handling by placing suitable materials directly in the designated final locations, if possible and so directed by the Engineer.

F. Excavated materials that are acceptable for use as fill but are too wet for immediate compaction shall be aerated by disking and mixing until the moisture content is reduced sufficiently to permit them to be placed in the embankment.

3.3 FOUNDATION PREPARATION

A. Should the excavation be carried below the lines and grades specified on the Drawings or should the bottom of the rock excavation be disturbed because of the Contractor's operations, refill to the proper elevation with backfill concrete in accordance with Section 03300: Cast-In-Place Concrete at no cost to the Owner.

B. For areas identified by the Engineer as unsuitable foundation, remove this material to the depths established by the Engineer.

C. Structure foundations. - The bottom and side slopes of soil excavations upon or against which concrete will be placed shall be excavated to the required dimensions as shown on the Drawings or as required by OSHA. No material will be permitted to extend within the neatlines of the structure.

D. Excavate foundations to final grade using procedures that do not disturb the subgrade.

3.4 FIELD QUALITY CONTROL

A. The Engineer will conduct visual inspections of excavation bottoms and foundation subgrades. The Engineer will accept suitable subgrades in writing. Soft or yielding areas shall be excavated and backfilled with suitable material as specified and as approved by the Engineer.

END OF SECTION

SECTION 02316
BORROW AREA DEVELOPMENT

PART 1 GENERAL

1.1 SUMMARY

A. This specification section covers the following items of work:

1. Sources of materials for construction from on-site sources.
2. Requirements for borrow areas.
3. Requirements for processing of materials from on-site sources or borrow areas.

1.2 REFERENCES

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

1.	ASTM C 117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
2.	ASTM C 136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
3.	ASTM D 75	Standard Practice for Sampling Aggregates.

1.3 DEFINITIONS

A. On-site Borrow: Material that is the source of suitable materials for fill, with or without processing.

1.4 SUBMITTALS

A. Submit a borrow area development plan. . The plan shall include the proposed methods for pre-irrigating, drying, excavating (including permanent excavation slopes and permanent slope stabilization measures), and processing and stockpiling borrow area materials. The plan shall address the following issues:

1. Proposed stockpile areas for pre and post processed materials.
2. Method and rate of moisture conditioning, including drying and wetting.
3. Method of excavation and material handling, including proposed equipment and rates of excavation.
4. Sequence of excavation.
5. Drainage, dewatering, and erosion control.
6. Grading and reclamation.
7. Safety and security.

PART 2 PRODUCTS

2.1 MATERIALS

A. The borrow areas may be used as a source for Embankment Fill. Some screening and processing may be required to produce Embankment Fill meeting the requirements of Section 02330: Fill.

PART 3 EXECUTION

3.1 GENERAL

A. Where necessary, clear, grub, and strip the portions of borrow, stockpile and process areas in accordance with Section 02230: Clearing and Grubbing, and 2235: Stripping and Stockpiling Topsoil.

B. Conduct borrow, stockpile and process operations without damaging or removing existing structures or substructures not designated for demolition on the Drawings.

C. Dewater borrow area excavations in accordance with the Section 02240: Dewatering to obtain borrow materials. Such work is considered incidental to borrow operations.

D. On-site Borrow Area Demobilization and Clean-Up:

1. At the end of onsite borrow area operations, remove all equipment, lighting, temporary fencing, and water removal and drainage systems. Grade and stabilize the excavation slopes as shown on the Drawings and as specified.
2. Restore borrow processing and stockpile areas to preexisting grades and revegetate in accordance with Section 02920: Seeding and Reclamation of Disturbed Areas.

E. Disposal of Excess and Unsuitable Materials:

1. Dispose or salvage excess and unsuitable materials, rubble, and waste derived from borrow area operations in accordance with Section 01575: Disposal of Waste Materials.

F. The Engineer may inspect, sample, and perform quality assurance field and laboratory tests on the materials from the borrow areas on a periodic basis. Provide access for the Engineer to areas where inspection, sampling, and testing is to be performed schedule construction operations to avoid interference with the sampling and testing operations.

3.2 SOIL PROCESSING AND STOCKPILING

A. To the extent possible, adjust moisture content before stockpiling fill materials for placement

3.3 QUALITY CONTROL TESTING

A. Final acceptance for materials obtained from on-site borrow sources will be based on acceptable test results when material is tested in accordance with Section 02330: Fill.

END OF SECTION

SECTION 02330
FILL

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes furnishing, placing, and compacting fill materials.

1.2 REFERENCES AND DEFINITIONS

A. All references are the most recent version.

B. American Society for Testing and Materials International (ASTM)

1.	ASTM C 117	Standard Test Method for Materials finer than 7-μ (No. 200) Sieve in Mineral Aggregates by Washing
2.	ASTM C 136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
3.	ASTM D 422	Standard Test Method for Particle Size Analysis of Soils
4.	ASTM D 698	Standard Specification for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
5.	ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
6.	ASTM D 2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
7.	ASTM D 2487	Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
8.	ASTM D 2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
9.	ASTM D 2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
10.	ASTM D 4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
11.	ASTM D 4254	Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
12.	ASTM D 4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
13.	ASTM D 4643	Standard Test Method for Determination of Water Content of Soil by the Microwave Oven Method
14.	ASTM D 4718	Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
15.	ASTM D 5080	Standard Test Method for Rapid Determination of Percent Compaction
16.	ASTM D 6913	Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
17.	ASTM D 6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil- Aggregate by Nuclear Methods (Shallow Depth).

B. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO T272 Standard Method of Test for Family of Curves—One Point Method

C. Definitions

1. Fines: Material passing the No. 200 sieve.
2. Borrow: Material excavated on the site, or taken from designated areas approved by the Owner and Engineer.
3. Well-graded: A mixture of particle sizes that has no specific concentration, or lack thereof, of one or more sizes. A material type that, when compacted, produces a strong and relatively incompressible soil mass with a minimum of voids.
4. Coverage: One coverage is defined as the result of successive passes by a piece of compaction equipment, which by means of sufficient overlap, will ensure that all areas of the layer or lift being compacted have been subjected to one pass of the compaction equipment.
5. Optimum Moisture Content: That moisture content which will result in a maximum dry unit weight of the soil resulting from the ASTM D 698 laboratory compaction test.
6. Percent Compaction: The percent compaction in place shall be calculated as the ratio (in percent) of the in place dry density to the estimated maximum dry density, in accordance with ASTM D 698, of the representative fill material at the location of the in-place density test. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as accepted by Engineer.
7. Prepared Subgrade: Ground surface after completion of clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and scarification and compaction of subgrade.
8. Proof Rolling: Rolling a soil surface with a minimum of 4 passes with approved compaction equipment for the purpose of detecting and compacting soft or loose areas that will not support future loading without excessive settlement.
9. Subgrade: Layer of existing soil after completion of clearing, grubbing, scalping of sod, or stripping of topsoil and excavation to grade prior to placement of fill or concrete.
10. Unsuitable Materials: Materials that contain waste, debris, roots, organic matter, frozen matter, or any other materials determined by the Engineer to not meet the specifications for required fills. Unsuitable materials does not include wet or dry materials requiring moisture conditioning for placement, or materials requiring processing to remove oversize particles in order to meet the specifications for a particular fill.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Complete earthwork plan. The earthwork plan may be combined with the excavation plan in Section 02315: Excavation. The earthwork plan shall be submitted at least 30 days in advance of the start of earthwork. The earthwork

construction plan shall be approved by the Engineer prior to any earthwork activities. Include all the following in the earthwork construction plan:

1. Proposed schedule.
2. Proposed borrow source(s) for offsite materials and proposed method(s) of sampling on-site and offsite source(s) for acceptance.
3. Proposed soil excavation, transport, processing, placement, compaction, and moisture control equipment, including equipment catalog with weight, dimensions, and operating data.
4. Proposed equipment and methods for removing embankment material from required excavations.
5. Proposed plan and sequencing for excavation including the extent and quantity of excavation, and an excavation schedule.
6. Proposed excavation, stockpiling, and staging plan describing handling and transport of on-site and off-site materials including proposed haul routes.
7. Proposed embankment plan for the surplus excavated material to be placed within the staging and stockpile area.
8. Proposed plan to obtain, convey, and store construction water, including proposed water source.
9. Proposed methods for processing including means and methods of moisture conditioning in advance of excavation and after placement.
10. Proposed method of protecting Work, to include temporary dewatering, drainage, moisture conditioning, and frost protection measures.
11. Proposed placement plan for drain materials that limits waste of these materials. Include proposed equipment, and methods proposed for temporary stockpiling, hauling, spreading, placing, and compacting the granular drain materials.

C. Samples: Submit samples of on-site excavated materials and off-site materials for Engineer's approval. For imported material, submit samples and laboratory test results prior to shipment of the material to site.

D. Submit gradation and moisture density compaction curve test reports for all imported earthwork materials, material from designated borrow areas, and on-site excavated materials suitable for use as fill. Any time the Contractor changes the source and/or stockpile from which materials are obtained, or should proposed material not meet requirements, additional gradation and moisture density compaction curve test reports for these new sources shall be required. Include costs for all testing in the bid price. No additional compensation will be allowed for testing.

E. Certified truckload weight bills: Provide the original certified truckload weight bills at the time of delivery for all materials delivered to the site.

PART 2 PRODUCTS

2.1 EMBANKMENT FILL

A. Embankment Fill: Suitable materials from required excavations or approved borrow sources, having a maximum particle size of 4 inches, a minimum of 10% fines, and well graded. Embankment fill is for filling within the downstream buttress.

B. Excavated on site materials that meet or are processed to meet the requirements in subparagraphs 2.01.A above are acceptable as embankment fill.

C. Embankment fill must be tested by the Contractor and approved by the Engineer before use.

D. A list of required material QC testing for embankment fill is presented in Table 1. The tests shall be conducted by the Contractor's independent testing firm at the frequencies designated in these specifications unless otherwise directed by the Engineer.

TABLE 02330-1
EMBANKMENT FILL TESTING

Test	Test Method (Current Version)	Test Frequency
Classification	ASTM D 2487	Minimum 4 tests per source[(1)]
Grain size with – #200 Wash	ASTM D 422, D-1140	
Moisture content	ASTM D 2216	
Atterberg limits	ASTM D 4318	
Laboratory Moisture-Density (Standard Proctor) [(3)]	ASTM D 698	Minimum 4 tests per material classification

Notes:

(1) Material classification tests, including grain size and Atterberg limits for fill from on site or imported sources shall be conducted on samples from stockpiled material.

(2) Samples for Standard Proctor testing shall be obtained from material mixed and stockpiled on site after material classification testing to represent the variation in material types.

2.2 FILTER SAND

A. Well graded sand material obtained from an approved off-site source, conforming to ASTM C 33 except as otherwise specified, and be graded within the following limits:

TABLE 02330-2
FILTER SAND GRADATION

U.S. Standard Sieve	Percent Passing by Weight
3/8 inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	0-10
No. 200	0-3

B. The specified gradation limits for the No. 200 sieve are different from ASTM C 33, and have been adjusted specifically for this project.

C. The fraction of filter sand material finer than the No. 40 sieve shall be classified as non-plastic based on Atterberg Limit testing.

D. The range specified for the No. 200 sieve is for material delivered and stockpiled at the site. Material sampled in place after compaction shall have a range of 0 to 5 % passing the No. 200 sieve.

E. A list of required material QC testing for filter sand is presented in Table 3. The tests shall be conducted by the Contractor's independent testing firm at the frequencies designated in these specifications unless otherwise directed by the Engineer.

TABLE 02330-3
FILTER SAND TESTING

Test	Test Method (Current Version)	Test Frequency
Grain size	ASTM C 117 and C 136	2 tests on samples of material stockpiled at the site before placement. 2 test on in-place material after compaction
Minimum/Maximum Density	ASTM D 4253 and D 4254	Minimum 1 test per source

2.3 DRAIN GRAVEL

A. Conforming to ASTM C 33, #8 Coarse Aggregate except as otherwise specified, with angular to sub-angular shape. Rounded gravel will not be accepted. Drain gravel shall be graded within the following limits:

TABLE 02330-4
DRAIN GRAVEL GRADATION

U.S. Standard Sieve	Percent Passing by Weight
1/2 inch	100
3/8 inch	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5
No. 50	0-3

B. The above specified gradation requirements were modified from the ASTM C 33 gradation size No. 8 for coarse aggregate. The requirement for the No. 50 sieve differs from that stated in the ASTM standard, and has been changed specifically for this project.

C. The range specified for the No. 50 sieve is for material sampled in place after compaction.

D. A list of required material QC testing for drain gravel is presented in Table 5. The tests shall be conducted by the Contractor's independent testing firm at the frequencies designated in these specifications unless otherwise directed by the Engineer.

TABLE 02330-5
DRAIN GRAVEL TESTING

Test	Test Method (Current Version)	Test Frequency
Grain size	ASTM C 117 and C 136	2 tests on samples of material stockpiled at the site before placement. 2 test on in-place material after compaction

2.4 AGGREGATE BASE COURSE

A. Aggregate base course shall meet the Colorado Department of Transportation 2005 Standard Specifications for Road and Bridge Construction – Section 703, Table 703-3, Class 5 Base Course, and be graded within the following limits:

TABLE 02330-6
AGGREGATE BASE COURSE TESTING

U.S. Standard Sieve	Percent Passing by Weight
1 1/2 inch	100
1 inch	95-100
No. 4	30-70
No. 200	3-15

B. A list of required material testing for aggregate base course is presented in Table 02335-8. The tests shall be c unless otherwise directed by the Engineer. If material tests from the source for the conducted by the Contractor at the frequencies designated specified properties conducted within the last year may be provided, some source testing may be waived at the Engineer's discretion.

TABLE 02330-7
AGGREGATE BASE COURSE TESTING

Test	Test Method (Current Version)	Test Frequency
Grain size with – #200 Wash	ASTM D422, D-1140	Minimum 1 per source[1]
Atterberg limits	ASTM D4318	
Laboratory Moisture-Density (Standard Proctor)	ASTM D698	Minimum 1 test per source[2]

C. Grain size and Atterberg limits for aggregate base course shall be conducted on samples from material stockpiled on site.

D. Samples for Standard Proctor testing shall be obtained from material mixed and stockpiled on site and selected after material classification testing to represent the variation in material types.

2.5 COMPACTION EQUIPMENT

A. Compaction equipment shall conform to the manufacturer's specifications and shall be maintained in good working condition at all times.

B. Compaction Equipment: Self propelled, padfoot, vibratory compactors with a minimum static operating weight of 25,000 pounds, and capable of producing a centrifugal force of 25,000 to 50,000 pounds. Smooth drum rollers meeting the static and centrifugal forces specified above may be approved at the discretion of the Engineer for compaction of free

draining granular materials except where special compaction is required. Operate vibrating compactors at a constant frequency of vibration, as recommended by the equipment manufacturer for the material type being compacted, and as approved by the Engineer.

C. Special Compaction: Use hand operated power tampers, vibratory plate compactors having a minimum static weight of 300 pounds and a minimum dynamic force of 1,000 pounds, or other special compaction equipment acceptable to the Engineer to obtain the compaction specified. Use special compaction equipment in locations where other compactors specified in this Section cannot operate effectively, and as specified for areas requiring special compaction as specified herein.

D. All equipment and tools used in the performance of the Work are subject to review by the Engineer before work is started.

E. Provide compaction equipment appropriate for the material types as approved by the Engineer, and sufficiently sized to obtain the specified densities.

F. Provide hand-operated compaction equipment in areas closer than 3 feet from structures or 2 feet from pipes (for special compaction).

G. Operate and maintain compaction equipment in accordance with the manufacturer's instructions and recommendations.

H. Provide equipment for applying water of a type and quality adequate for the work, free of leaks and equipped with a distributor bar or other approved device to ensure uniform application.

I. Provide equipment for mixing, aerating and moisture conditioning fill materials, such as blades, discs, or other approved equipment.

PART 3 EXECUTION

3.1 GENERAL FILL PLACEMENT

A. Make provisions and plan for potential winter operations. This shall be documented in Contractor’s method submissions and accommodated in their schedule.

B. Before placing fill material, verify that the subgrade has been prepared and inspected by the Engineer. Do not place fill without written approval from the Engineer.

C. Do not place fill material until the subgrade has been dewatered in accordance with Section 02240: Dewatering, and the prepared subgrade has been inspected and approved by the Engineer.

D. Moisten earth-excavated surfaces upon or against which concrete is to be placed with water, and tamp or roll to form a firm foundation upon which to place concrete.

E. The compacted surface of any layer of fill or subgrade which is too wet or too dry for bonding to the next layer of material shall be dried or moistened, scarified, and compacted before the next layer is placed.

F. Place fill to the lines, grades and cross-sections shown on the Drawings and written field clarifications by the Engineer.

G. Take special care to ensure bonding of new embankment to previously placed or existing embankment material by benching in approximately one foot horizontally into the previously placed and compacted embankment, as each new fill layer is placed and compacted, unless otherwise directed by the Engineer. If the surface of the fill or the adjacent embankment dries and cracks after exposure, or if loose material is present, bench into existing embankments sufficiently to remove loose material, rework the dry material into new moisture conditioned fill, and still extend into compacted fill. For filter or drain materials, place directly against compacted fill, do not bench or mix edges of filter or drain materials into compacted fill.

H. The distribution and gradation of materials throughout the fill shall be such that the material will be free from lenses, pockets, streaks or layers of material differing substantially in texture, gradation and moisture from the surrounding material. The combined excavation and placing operations shall be such that the fill shall be mixed and blended sufficiently to provide the most homogeneous section and best practical degree of compaction and stability.

I. Control and conduct all operations including but not limited to transporting, stockpiling, excavating, producing, and placing the materials to minimize contamination, segregation, and particle breakdown.

J. Do not place frozen fill material, and do not place fill below water or on frozen ground. Stop fill placement temporarily during unsuitable weather conditions, as directed by the Engineer.

K. Fill materials shall be thoroughly moisture treated as necessary to achieve compaction, and shall be maintained at the appropriate moisture content during compaction.

L. Re-work materials which have not been placed in accordance with these specifications. Re-working may include removal, rehandling, reprocessing, recompacting, or combinations of these procedures, as required by the Engineer.

M. Do not place fill adjacent to structures before the concrete has attained sufficient strength to withstand the applied construction loads. No fill material shall be placed against structure walls until the concrete has attained at least 100% of the design compressive strength per Division 3 of these specifications.

N. Where applicable, place fill against structures in uniform lifts on both sides of the structure such that no unbalanced loading will occur against the structure.

3.2 SUBGRADE PREPARATION

A. Excavate to final grade in accordance with Section 02315: Excavation so that the subgrade is not disturbed.

B. The foundation for all structures shall be placed on natural soils, bedrock or, in the case of fill conditions, foundations shall be placed on fill approved by the Engineer. Compacted, approved fill will be required where excavation is required to remove unsuitable existing materials below structures.

C. Notify the Engineer as soon as possible of any unusual soil conditions, soil conditions that vary from test borings, or soils of questionable strength or bearing capacity.

D. Subgrade preparation shall consist of scarifying the material a minimum of 6 inches in depth, moisture conditioning the scarified material to the Optimum Moisture Content, and compacting the area with a minimum of 4 passes with approved compaction equipment prior to fill placement.

E. Proof roll prepared subgrades in the presence of the Engineer. The proof roll shall consist of four overlapping rolls using approved compaction equipment. Proof rolling of small areas may be performed using hydraulic backhoe-mounted vibratory compactors or hand-operated jumping jacks subject to Engineer's approval.

F. Excavate soft/yielding subgrade as determined by the Engineer and replace with the appropriate compacted new embankment fill material for the location in the foundation and adjacent new embankment zone.

G. For areas identified by the Engineer as unsuitable, remove the material to the depths and limits established by the Engineer. Replace removed material with suitable compacted fill material placed per these specifications and to the required elevations.

3.3 FILTER SAND AND DRAIN GRAVEL PLACEMENT

A. Place filter sand and drain gravel to the locations, lines, grades, and thicknesses shown on the drawings.

B. Control and conduct all operations including but not limited to transporting, stockpiling, excavating, producing, and placing the materials to minimize contamination, segregation, and particle breakdown.

C. Place filter sand in maximum 9-inch loose lifts; thoroughly wet the sand immediately before compaction using moisture application procedures as approved by the Engineer, and compact to 65 to 70% Relative Density as determined by ASTM D4253 and D4254. Do not over compact sand or allow breakdown of sand grains to create fines in the sand mass.

D. Prevent soils from adjacent zones from being tracked onto the filter sand. Remove and replace all filter sand material containing unsuitable material.

E. Place drain gravel in maximum 9-inch loose lifts and compact with 4 coverages of approved compaction equipment. Do not over compact gravel or allow breakdown of individual grains.

F. Rework materials, which have not been placed in accordance with these specifications. Reworking may include removal, recompacting, reconditioning, or combinations of these procedures, as required by the Engineer.

3.4 PLACING EMBANKMENT FILL AND AGGREGATE BASE COURSE

A. Place embankment fill materials in uniform horizontal layers with a loose lift thickness of 8 inches or less.

B. Place aggregate base course fill materials in uniform horizontal layers with a loose lift thickness of 8 inches or less.

C. Add water to the fill prior to compaction to obtain the moisture content required to achieve specified compaction of the fill. Use moisture addition procedures, as approved by the Engineer.

D. Placement moisture content: 2 percentage points below to 2 percentage points above the optimum moisture content (ASTM D 698).

E. Compaction: Not less than 95% of the laboratory maximum dry density (ASTM D 698).

3.5 SPECIAL COMPACTION

A. Special compaction is required within 3 feet laterally of all structures, and in tight, restricted, or steep areas not accessible by larger rollers, and within 2 feet of pipes. The intent of the zones of special compaction is to prevent damage to structures or pipes from compaction equipment loads.

B. Place specially compacted fill in accordance with paragraph 3.5 above, except for the following:

1. Compact in maximum 6-inch thick loose lifts.
2. Compaction equipment used in special compaction areas: Small rollers, walk-behind sheeps-foot rollers, vibratory plates, or other small compactors appropriate for the material and as approved by the Engineer. Do not use equipment which by its weight or movement will damage, move or tilt out of alignment any part of the pipe or structure above, adjacent, or below the ground surface.

3.6 TOLERANCES

A. Finished earthen surfaces: Within a tolerance of plus or minus 0.1 foot from the grades shown on the Drawings.

3.7 FIELD QUALITY CONTROL

A. Give advance notice of at least 48 hours to Engineer for the following:

1. Before commencement of foundations proof-rolling.
2. Before commencement of placement and compaction of fill.
3. Before sampling or testing fill materials.

B. Specified QC testing is the responsibility of the Contractor and shall be performed by qualified, approved personnel and by a qualified, approved commercial testing laboratory/firm, subject to approval by the Engineer.

C. The final acceptance or rejection of the fill will be based on the Engineer's judgment considering test results and the general disposition of the fill.

D. If the fill is rejected, remove and replace rejected material at no cost to Owner.

E. Contractor’s qualified independent testing firm shall conduct testing at the minimum frequencies for materials under Part 2 in this Section.

F. All testing and sampling locations are subject to approval by the Engineer

G. Contractor's qualified independent testing firm shall conduct field testing for embankment fill, filter sand, and aggregate base course at the minimum frequencies specified in Table 02330-9 below.

TABLE 02330-8
FIELD QUALITY CONTROL TESTING

Test	**Test Method (Current Version)**	**Test Frequency**
Field density and moisture (nuclear method)	ASTM D 6938	Embankment Fill: Minimum one per 500 CY Placed [(1)]
		Filter Sand: One per 500 CY Placed
		Aggregate Base Course: One per 50 CY Placed
Sand Cone	ASTM D 1556	1 per 20 nuclear density tests[(2)]
Moisture correlation (oven dried)	ASTM D 2216	1 per 20 nuclear density tests[(2)]

Notes:
[(1)]Minimum one per day (on days of placement) or one per area of placement and a minimum one field density and moisture test every 12 inches of compacted embankment fill, whichever results in the greatest number of tests.
[(2)]Specified correlation testing frequency shall be following an initial calibration check and moisture calibration adjustment, if necessary, in accordance with ASTM D 6938 and a minimum of 4 density and moisture correlation tests using ASTM D 1556 on each material type at the start of testing.
CY = Cubic yards

H. If any of the analyses or visual inspection by the Engineer indicates the material may not meet specifications or has changed significantly from material represented by material testing, additional testing shall be performed by the Contractor to treat the changed material as a new material type. No fill material will be permitted in the work that has not, in the Engineer's opinion, been represented by material QC testing. For subsequent tests to prove conformance with the Technical Specifications, additional soil samples shall be collected from the borrow area, on-site stockpiles, or from in-place areas as directed and as deemed appropriate by the Engineer. Such additional testing shall be carried out in accordance with the requirements and the standard test methods for pre-construction testing set forth in the specifications.

I. The percent compaction requirements for materials where a moisture density relationship can be established will be evaluated as follows: The in-place density as compacted by the Contractor will be determined by the field density test using the nuclear method (ASTM D 6938) or sand-cone method (ASTM D 1556). The maximum dry density of the fill at the location of the in-place density test will be estimated using a one-point moisture density test and full-curve moisture density tests (family of curves) of representative fill materials. Both the one-point and the full-curve laboratory moisture-density tests will be performed according to ASTM D 698. The one-point test results will be compared to the representative moisture density curves to estimate the maximum dry density of the compacted fill at the location of the in-place density test. Comparison of the one-point laboratory moisture density test to the family of curves will be in accordance with AASHTO T 272, except that ASTM D 698 will be used as the laboratory moisture density test. The percent compaction in-place will be calculated as the ratio (in percent) of the

in-place dry density to the estimated maximum dry density of the compacted fill at the location of the in-place density test.

J. The Contractor shall be responsible for scheduling work activity in accordance with material QC testing and Engineer's review period.

K. The Engineer may retain its own quality assurance laboratory for material testing services. The Contractor shall provide equipment and labor to assist the Engineer in any quality assurance testing and in obtaining soil samples. The Contractor shall cooperate in every way with this effort.

END OF SECTION

SECTION 02370
RIPRAP

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Screening, sorting, and processing riprap from on-site excavations to meet the specified gradation.

B. Placing riprap at the locations shown on the Drawings.

C. Furnishing and placing riprap bedding at the locations shown on the Drawings.

1.2 REFERENCES

A. American Society for Testing and Materials International (ASTM)

1.	ASTM C 88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
2.	ASTM C 127	Test Method for Specific Gravity and Absorption of Coarse Aggregate.

B. American Association of State Highway and Transportation Officials (AASHTO)

1.	AASHTO T96	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
2.	AASHTO T104	Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. List of equipment proposed for use in hauling and placing riprap and riprap bedding.

C. Proposed source(s) of riprap bedding.

D. Certified copies of test certificates from a qualified testing laboratory stating that the riprap and riprap bedding conforms to the requirements of this Section.

E. Samples of riprap and riprap bedding if requested by the Engineer. Minimum sample size: 1 ton for each riprap type, and 50 pounds for riprap bedding.

F. Proposed plan and list of equipment for screening, sorting, stockpiling, and processing existing on-site riprap.

PART 2 PRODUCTS

2.1 RIPRAP

A. Riprap shall be dense, angular, reasonably well-graded, and with sound fragments resistant to abrasion. Material shall be free of cracks, seams, clay, organic material and

other defects that would hasten degradation by water and/or frost action. Rounded boulders or cobbles shall not be accepted as riprap.

B. Existing riprap material excavated from the upstream and downstream dam slopes and from planned rock excavations may be used as riprap without testing if the riprap material is acceptable to the Engineer.

C. Neither the breadth or thickness of any piece of riprap shall be less than one-third of its length.

D. Material used for riprap may be approved by the Engineer if, by visual inspection, the rock is determined to be sound and durable. The Engineer may require the Contractor to furnish laboratory results if, in the Engineer's opinion, the material is marginal or unacceptable.

E. Riprap shall be well-graded, from the smallest to the largest size, and shall be graded within the limits in Table 02375-1:

Table 02375-1
Riprap Gradation

Maximum particle size:	18 inches
Average particle size:	12 inches
Minimum particle size:	6 inches

2.2 RIPRAP BEDDING

A. Material used for riprap bedding shall meet the requirements for Drain Gravel in Section 02330: Fill.

PART 3 EXECUTION

3.1 PLACING DRAIN GRAVEL RIPRAP BEDDING

A. Place riprap bedding at the locations, thicknesses, lines, and grades shown on the Drawings.

B. General: Surfaces to receive bedding materials shall be smooth and firm, free from deleterious materials, and shall be brought to the lines and grades shown on the Drawings. Prepare the surfaces that are to receive bedding materials, by rolling and trimming as necessary to enable a uniform lift of bedding of the specified thickness to be placed thereon. Surface preparation will include, but not be limited to, bringing all low spots up to the lines and grades shown on the Drawings with compacted fill and removing all material projecting above lines and grades shown on the Drawings.

C. Placement: Place the bedding materials in a manner that minimizes segregation and results in uniform lifts of bedding materials of the thicknesses shown on the Drawings. Place riprap bedding materials from the bottom of the slope working up the slope.

D. Moisture condition the materials as necessary to control dust and to minimize segregation.

E. Compaction is not required for the bedding materials; however, bedding materials shall be spread in such a manner as to form a smooth, uniform layer under the riprap.

F. Chinking: For the walkway path, provide laborers and tools required to chink riprap bedding to fill the voids in the riprap surface to provide a smooth walking surface.

3.2 SCREENING, SORTING AND PROCESSING EXISTING RIPRAP

A. Screen, sort, and process riprap obtained from site excavations to create mixtures of material that are graded to meet the specified riprap grading. Placed graded material in separate stockpiles and obtain Engineer approval before placing.

3.3 PLACING RIPRAP

A. Place riprap at the locations, thicknesses, lines, and grades shown on the Drawings.

B. Place riprap by dumping and working with a hydraulic excavator, and smoothing by moving rocks in such a manner as to produce a well-graded mass of rock with a minimum practical percentage of voids and that the material, when in place, is stable. Place riprap from the bottom of the slope working up the slope. The finished riprap shall be free from objectionable pockets of unacceptable soil fines, small stones and clusters of nested large rocks, as determined by the Engineer.

C. Place riprap to full layer thickness in one operation in such a manner as to minimize segregation and avoid displacement of underlying bedding materials.

D. Chinking: Provide laborers during placement for rearrangement of loose rock fragments, "chinking" of void spaces, and hand placement as needed to comply with the requirement of a well-keyed and stable layer of rock riprap.

3.4 TESTING

A. Riprap obtained on-site and accepted by the Engineer does not need to be tested for physical properties before use.

B. Conduct test placements of riprap and riprap bedding (with a minimum volume of 50 cubic yards each) that are observed by the Engineer to develop a procedure for placement of riprap and riprap bedding, and to confirm the placement methods result in suitably placed riprap and riprap bedding.

C. Control of gradation will primarily be by visual inspection. The Engineer will be the sole judge of riprap gradation acceptability by visual inspection. If the Engineer elects to perform gradation tests of the riprap, provide equipment and labor to assist the Engineer in performing the tests.

END OF SECTION

SECTION 02620
HDPE DRAIN PIPE

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes furnishing and installing slotted and solid HDPE drain pipes in locations indicated on the Drawings, and cleaning and performing video inspection of drain pipes after installation.

1.2 REFERENCES

A. American Society for Testing and Materials International (ASTM)

1.	ASTM D 2321	Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
2.	ASTM D 3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
3.	ASTM F 477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
4.	ASTM F 2306	Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile- Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications

B. American Association of State Highway and Transportation Officials (AASHTO)

1.	AASHTO M 252	Corrugated Polyethylene Drainage Pipe.
2.	AASHTO M 294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm Diameter.
3.	AASHTO SSHB	Standard Specifications for Highway Bridges

C. National Transportation Product Evaluation Program (NTPEP)

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Material Certifications

1. Manufacturer’s certification that raw materials and pipe to be furnished meet the requirements of this Section. The certification shall state that pipe complies with these specifications based on complete tests which the manufacturer has conducted on the lot.
2. Product data for piping materials, fittings, and jointing methods; and recommended method of installation of pipe and construction of branches in pipe.
3. National Transportation Product Evaluation Program audit report indicating approval of specified pipe.

C. Installation Plan

1. Installation plan outlining the proposed plan for constructing drains shall be submitted to the Engineer for approval at least 14 days prior to the anticipated commencement of the Work. Plan shall include a proposed schedule, proposed products to be used during installation, and measures that will be put in place to protect the Work during construction. Contractor shall include in the plan, measures to keep drain materials from becoming contaminated with soil, or other materials during stockpiling and construction activities.

D. Inspection Video

1. Submit 3 copies of inspection video(s) in DVD format with audio recording documenting video inspection of all drain pipes.

1.4 QUALITY ASSURANCE

A. Pipe manufacturer shall be a participating member of the National Transportation Product Evaluation Program. Only products from suppliers whose manufacturing plant and PE pipe products comply with this specification will be approved.

1.5 STORAGE AND HANDLING

A. Handle materials to ensure delivery to installation locations in sound undamaged condition.

B. Thermoplastic pipe shall be unloaded and handled with reasonable care. Do not drop pipe, for pipes smaller than 18" in diameter manual handling is acceptable. For pipes larger than 36" in diameter, lift with a sling at two points spaced 10 feet apart. Do not use a loading boom or forklift to lift directly on or inside the pipe.

C. Non-palletized pipe may be temporarily stockpiled on a flat, clear area. Stack pipe no higher than 6 feet.

D. Do not drag or strike pipe ends against anything.

E. Store and block pipe in a manner that prevents warping or distortion.

1.6 COORDINATION

A. Coordinate video inspection of pipe so the Engineer is present. Notify the Engineer a minimum of 48 hours before the inspection is to be conducted.

PART 2 PRODUCTS

2.1 DRAIN PIPE

A. HDPE Resin

1. HDPE pipe and fittings shall be manufactured from virgin resin. HDPE pipe and fittings manufactured from reclaimed or recycled resin will be rejected.
2. Virgin material for pipe and fitting production shall be high density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch diameters, or 435400C for 12- through 60-inch diameters, as

defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%.

B. HDPE Pipe

1. Furnish pipe in the nominal sizes shown on the Drawings.
2. Slotted pipe

   a. AASHTO M252, Type SP pipe with corrugated exterior and smooth interior.
   b. Perforations

      1) AASHTO Class 2 slotted holes with a width of 0.125 inches.
      2) Clean and completely free of burrs, cuttings, frayed edges, tears and cracks, and other defects.
      3) Pipe not meeting these requirements will be rejected. Pipe is not allowed to be slotted in the field.

3. Solid pipe

   a. AASHTO M252, Type S pipe with corrugated exterior and smooth interior.

4. Pipe Joints

   a. Join pipes using a bell and spigot joint meeting AASHTO M252, AASHTO M294 or ASTM F2306.
   b. Gaskets shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly.

5. Pipe and Connection Type by Area:

   a. Toe drain outfall: Solid, water-tight.
   b. Spillway foundation drains and toe drains: Perforated and solid, soil-tight.

C. HDPE Fittings

1. Suitable for use in perforated and solid corrugated drain pipe
2. Manufactured for the diameter of pipe being connected.
3. Water–tight or soil-tight connections as specified herein.

D. Manufacturer and product:

1. Manufacturer: Advanced Drainage Systems (ADS)/Hancor or approved equivalent.
2. Product: N-12 WT1B or ST1B, or equal as approved by the Engineer.

2.1 LOCKING CLEANOUT CAP

A. Two-piece aluminum locking cap, sized for pipe, as manufactured by Royer Quality Castings, 380 S. Reading Ave., Rear, Boyertown, Pennsylvania 19512, USA.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Install drain pipes in accordance with this Section, ASTM D 2321 and the manufacturer's written installation instructions. In case of a conflict, this specification shall govern.

B. Excavate for drains in accordance with Section 02315: Excavation.

C. Furnish and place filter sand and drain gravel in accordance with Section 02330: Earthwork and this Section.

D. Place fill materials carefully around the drainage pipe so as not to disturb the drainage pipe and to hold it securely in position while the overlying material is being placed.

E. Due to the polyethylene corrugated drainage pipe's light weight and buoyancy, special care shall be exercised in laying the drainage pipe and placing materials adjacent to the pipe to ensure that the pipe is laid in a manner to remain on grade and in alignment.

F. Method of laying the drainage pipe shall prevent stretching of the pipe during laying operations.

G. Install couplings with a close fit and in accordance with the manufacturer's deflection tolerances. Install in a manner that maintains alignment of the pipe, prevents separation of the joints, and maintains gasket integrity.

H. Any drainage pipe which is broken, cracked, or otherwise unsuitable for use, as determined by the Engineer, shall be removed and replaced by the Contractor.

I. Check interior of pipes before making connections. Keep the drainage pipe free from deposits of snow, ice, mud, sand, gravel, or other foreign matter and in good working condition for the duration of the Work.

J. Remove and replace damaged sections of pipe.

K. Use straight pipe sections and elbows not exceeding 22.5°. Provide sufficient length between angled connections to allow for camera inspection equipment access.

L. Do not drop drain materials directly on pipe.

M. Support drain pipe circumferentially with drain material prior to backfilling above pipe.

N. Do not compact drain material directly over the drain pipe.

O. Prevent introduction of contaminants in drain materials.

3.2 FIELD INSPECTION AND TESTS

A. Do not bury, cover, or conceal piping until it has been inspected, tested and approved by the Engineer.

B. Deflection Test

1. The pipe shall be evaluated to determine whether the internal diameter of the barrel has been reduced more than 5% of nominal internal diameter when measured not less than 30 days after installation. Deflection testing may be waived at the discretion of the Engineer if video inspection can demonstrate that deflection has not occurred.
2. Pipes shall be checked for deflection using a mandrel or any other device approved by the Engineer. The mandrel shall be a nine arm mandrel and shall be sized and inspected by the Engineer prior to testing. The mandrel shall be pulled through the pipe with a force not exceeding 1000 pounds.
3. For locations where the pipe exceeds 5% of nominal internal diameter an evaluation of the deflection shall be conducted by the Contractor and submitted to the Engineer for review. Pipe remediation or replacement are required for locations where the Engineer determines that the deflection may compromise the drain integrity. For pipe deflections greater than 7.5% of the nominal metric inside diameter, remediation or replacement of the pipe is required.

C. Video Inspection

1. Conduct in accordance with Section 02090: Pipe Video Inspection after a maximum of 3 to 5 feet of fill has been placed over the pipe, and again after all fill materials have been placed.

3.3 PROTECTION AND CLEANING

A. Do not allow traffic loads on pipe and structures until the pipe has been covered to a depth sufficient to prevent damage or breakage.

B. All drain pipes shall be clear and free from debris at the time of final acceptance.

END OF SECTION

SECTION 02920
SEEDING AND RECLAMATION IN DISTURBED AREAS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Work includes seeding and vegetation reestablishment in areas disturbed by construction within the limits of disturbance as shown on Drawings.

B. Work includes preparing subsoil, placing topsoil, applying soil amendments, seeding, mulching, and maintaining vegetation establishment through the warranty period.

C. Summary of areas to be seeded and reclaimed:

1. Staging and stockpile areas.
2. Dam Embankment.
3. Borrow areas.
4. Other disturbed areas during construction as directed by the Engineer.

D. Areas that do not require seeding and reclamation:

1. Access roads.
2. Riprap areas.
3. Exposed rock areas as approved by the Engineer.

1.2 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Seeding plan containing:

1. Qualifying experience for person(s) responsible for supervision of seeding, hydraulic mulching, and seedling planting, for approval. Qualifying experience shall include names, addresses, and telephone numbers of references for proposed individual(s).
2. Proposed Plan for seeding, hydraulic mulching and Extended Term-Flexible Growth Medium (ET-FGM) installation, including equipment proposed for use.
3. Name and address of seed suppliers.

C. Seed Mixture Certifications:

1. For each Seed type:

   a. Origin of seed.
   b. Percent purity and germination.
   c. Prohibited and restricted weed seed content.
   d. Certificate of testing.

D. ET-FGM product data.

1.3 QUALITY ASSURANCE AND QUALITY CONTROL

A. Seed which has become wet, moldy or damaged in transit or in storage will not be accepted. No seed will be accepted with a test date of more than 9 months before delivery date to the site.

B. Soil amendments which become caked or damaged will not be accepted.

C. Seeded areas shall be reviewed by the Engineer for bare soils caused by surface or wind erosion. Bare areas caused by surface or gully erosion, blown away mulch, etc. shall be regraded, seeded, and have hydro mulch tackifier applied as necessary.

D. The seeding contractor shall have experience seeding in similar climates and zones on at least 5 projects of similar size and scope.

1.4 DELIVERY STORAGE AND HANDLING

A. Seed containers.

1. Sealed: Each type of seed shall be delivered in separate sealed containers and fully tagged unless exception is granted in writing by the Engineer.
2. Labeled: Seed shall be labeled in accordance with the state laws and the U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures are evidence of purity and germination.
3. Interstate shipping: In accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act.

PART 2 PRODUCTS

2.1 TOPSOIL

A. Topsoil shall conform to the product described in Section 02235: Stripping and Stockpiling Topsoil and this Section.

B. Native topsoil soil materials removed and stockpiled during stripping of the dam, staging and stockpile areas, and borrow/quarry areas, shall consist of soil material free of subsoil, refuse, stumps, roots greater than ½-inch , large rocks (greater than 6 inches), brush, noxious weed seeds or reproductive vegetative parts, heavy clay, hard clods, toxic substances, or other material which would be detrimental to plant growth.

2.2 SEED

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

1. Reclamation Seed Mix

COMMON NAME	**BOTANICAL NAME**	**% OF MIX BY QTY.**
GALLETA GRASS	HILARIA JAMES II	20%
HARD FESCUE	FESTUCA OVINA ‘DURAR’	20%
INDIAN RICEGRASS	ORIZOPSIS HYMENOIDES ‘ PALOMA’	12%
NEEDLE & THREAD GRASS	STIPA COMATA	1%

SHEEP FESCUE	FESTUCA OVINA 'COVAR'	8%
WESTERN WHEATGRASS	AGROPYRON SMITHII 'ARRIBA'	30%
SAND DROPSEED	SPOROBOLUS CRYPTANDRUS	1%
BLUE GRAMMA	BOUTELOUA GRACILIS	5%
SIDE OATS GRAMMA	BOUTELOUA CURTIPENDULA	3%
SEED AT 5 LB/ACRE PLS		

B. Drill seed 0.25 inch to 0.5 inch into the soil. In small areas not accessible to a drill, hand broadcast at double the rate and rake 0.25 inch to 0.5 inch into the soil. Minimum germination percentage is 85 percent. Substitutions will be allowed only when the designated material is not available and as authorized by the Engineer. Except for named varieties, all seed shall be from sources native to Colorado and adapted to the site.

C. A temporary cover crop, if proposed and approved, shall be provided by seeding sterile triticale at 10 lbs per acre, or other submitted and approved cover crop.

D. All seed shall be furnished in bags or containers clearly labeled to show the name and address of the supplier, the seed name, the lot number, net mass (weight), origin, the percent of weed seed content, the guaranteed percentage of purity and germination, pounds of pure live seed (PLS) of each seed species, and total pounds of PLS in the container. All seed shall be free from noxious weed species listed by the State and County.

E. Furnish a signed stated certifying that the seed is from a lot that has been tested by a recognized laboratory for seed testing within six months prior to the date of seeding. Seed which has become wet, moldy, or damaged in transit or in storage will not be accepted.

F. Seed and seed labels shall conform to all current State and Federal regulations and will be subject to the testing provisions of the Association of Official Seed Analysis. If seed available on the market does not meet the minimum purity and germination percentages specified, the Contractor must compensate for a lesser percentage of purity or germination by furnishing sufficient additional seed to equal the specified product. Product comparison shall be made on the basis of PLS in pounds.

2.3 AMENDMENTS

A. Soil amendment used in all seeded areas: Biosol® 6-1-1 or other compost type amendment as approved by the Engineer. Soil amendments shall meet the standard for grade and quality specified by Colorado State law and certified as free of persistent herbicides. Where soil amendments are furnished from bulk storage, the contractor shall furnish a supplier's certification of analysis and weight. Furnish a representative sample of the soil amendments for chemical analysis if requested by the Engineer.

2.4 EXTENDED TERM-FLEXIBLE GROWTH MEDIUM

A. Hydraulically applied mulch product with incorporated adhesive binder (tackifier), that does not contain any mineral filler, recycled cellulose fibers, clays, or other substances which may inhibit germination or growth of plants, and be non-toxic and non-injurious to plants, wildlife, or personnel.

B. Acceptable Product: Flexterra Extended Term-Flexible Growth Medium (ET-FGM) with Cocoflex addition, fully bio-degradable with a functional longevity of up to 24 months.

C. ET-FGM shall consist of wood and coconut fibers and manufacturer's proprietary biodegradable fibers bound together by adhesive and premixed at the factory. The wood fibers shall be manufactured expressly from clean whole wood chips and contain a range of fiber lengths. The adhesive binder shall be formulated to form a water resistant bond. The fibers shall be colored yellow or green with a water-soluble, non-toxic dye to help the operator apply the material uniformly. The mixture shall also contain a copolymer gel. A sample of the ET-FGM shall be submitted for approval at least two weeks in advance of its use on the project.

D. Mix Water: Clean, fresh and free of substances which could inhibit vigorous growth of plant material.

PART 3 EXECUTION

3.1 GENERAL

A. Reclaim and restore areas disturbed by construction activities within the limits of disturbance as shown on Drawings or determined by the Engineer.

3.2 EXAMINATION

A. Verify that prepared soil base is ready to receive the Work of this Section.

3.3 TOPSOIL PLACEMENT

A. In preparation for seeding, spread stockpiled topsoil evenly over areas to be reclaimed.

B. Final grades within borrow areas should undulate in topography plus or minus 6 inches to 1 foot from Drawing elevations emulating natural variations in topography. Areas of lower elevations should be graded perpendicular to creeks and other depressional landforms. Final grade within all other disturbed areas with a smooth blade grader, bull dozer, or other approved equipment, to the lines and grades shown on the Drawings, or as directed by the Engineer.

C. In areas where equipment cannot be operated, prepare the seedbed by hand.

D. If the topsoil is compacted, use a spring tooth harrow equipped with utility or seedbed teeth, or similar equipment loosen and smooth the soil surface either after or in conjunction with incorporation of soil amendments.

E. If topsoil is loose, compact with a cultipacker or similar implement to provide a firm seedbed.

F. Before seeding slopes flatter than 2H:1V, till the top 4 inches of the surface into an even and loose seedbed 4 inches deep. Before seeding slopes steeper than 2H:1V, the top 1 inch of surface shall be raked or tilled. Slopes shall be free of clods greater than 4 inches in diameter.

3.4 SEEDBED PREPARATION

A. Complete prior to seeding.

B. Scarify topsoil to minimum depth of 3-inches. Where equipment can operate on slopes safely, the seedbed shall be adequately loosened (4 to 6 inches deep) and smoothed.

C. Remove stiff clods, lumps, roots, litter, stones, and other foreign material greater than 6 inches in size from the surface. Dispose of removed materials in accordance with Section 01575: Disposal of Waste Materials.

D. Fill or smooth topsoil surface to remove rills, gullies and depressions.

E. Apply Biosol soil amendment at a rate of 1,500 lbs per acre, or as directed by the Engineer.

F. Protect prepared topsoil surfaces from erosion and washouts. Repair damaged surfaces as required.

3.5 SEEDING

A. Seed only from September 15 until consistent ground freeze or snow accumulation to avoid seed germination and breaking of dormancy and to prevent seedling frost damage. Seed shall not be sown when the surface soil or topsoil is in a frozen or crusted state. Seeding accomplished outside this time period will be allowed only when ordered by the Engineer or when the Contractor's request is approved in writing.

B. If seeding cannot be conducted by the time it is no longer feasible due to freezing, maintain erosion control. A cover crop may be planted from ground thaw to June 15 to stabilize the soil until fall planting can be done. If a cover crop is approved, keep stubble 8 to 18 inches high, and cut close to the ground before permanent upland seed is applied.

C. Seed will be hand broadcast only. Hydroseeding is not allowed. A spike-toothed harrow or similar equipment will be used to cover the broadcast seed. Seeded areas shall be raked or covered with soil to a depth of ¼ to ½ inch.

D. Seed will be tamped to provide satisfactory soil contact.

3.6 EXTENDED TERM-FLEXIBLE GROWTH MEDIUM

A. Apply ET-FGM over all seeded areas after broadcast seeding is completed. Do not mix seed into ET-FGM.

B. A technical representative of the manufacturer or authorized distributor shall be present for the initial mixing and application of the ET-FGM. Handle, mix and place ET-FGM in accordance with the manufacturer's written instructions and technical representative's sit-specific recommendations.

C. Do not apply when rain is imminent and manufacturer's minimum cure time cannot be met. Replace damaged ET-FGM.

D. Apply ET-FGM mixture at the manufacturer's recommended rate of application for site-specific conditions and slopes, but at a rate no less than 2,600 lbs/acre

E. Apply mixture in even layers, working back and forth between top and bottom of the slope, to uniformly cover soil with the mixture. Spray the product through a fan or slit-type nozzle (22 to 50 degree tip). The nozzle shall create a fine, uniformly dispersed spray that "rains down" on the soil. Unless otherwise approved, apply tackified mulch in opposing directions to ensure complete coverage with no “shadowing” in accordance with the manufacturers written instructions.

F. Do not apply tackified mulch in ditches or other areas of concentrated flow.

3.7 NOXIOUS WEED CONTROL

A. All Contractors employees and subcontractors shall follow applicable Project Weed Management Plans. See also Section 01350: Environmental Protection.

3.8 MAINTENANCE

A. Maintain the reclaimed areas for a period of 2 years after completion of seeding and planting.

B. Maintenance shall consist of repairing areas where damage is due to the Contractor’s operations, failure to establish a satisfactory stand of permanent grass seed as specified herein, or failure of ET-FGM mulch to prevent gullying or other seed and seedbed loss. Areas to be repaired shall be re-amended, reseeded, and remulched.

C. After Final Completion, access to the site will be allowed each year for inspections and maintenance. Coordinate all access for maintenance activities with Owner.

D. Reseed areas that show bare spots by the end of October of the year following the seeding.

E. Any seeded areas which are not producing a satisfactory stand of permanent grass seed within 2 years of the seeding operations shall be reseeded and remulched at no expense to the Owner.

F. Satisfactory Stand of Seed: A satisfactory stand of permanent grass seed is defined as a uniform coverage of the area to be seeded that prevents the formation of rills or other erosion damage, has a coverage rate equal to or greater than adjacent native grassed areas, and is acceptable to the Owner.

END OF SECTION

DIVISION 3 – CONCRETE

SECTION 03100
CONCRETE FORMWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast-in place concrete with shoring, bracing, and anchorage.

B. Form accessories.

C. Form stripping.

1.2 REFERENCES

A. American Concrete Institute (ACI)

1.	ACI 117	Standard Tolerances for Concrete Construction and Materials.
2.	ACI 301	Structural Concrete for Buildings.
3.	ACI 347	Recommended Practice for Concrete Formwork.

B. APA – The Engineered Wood Association

1.	PS-1	Structural Plywood.

1.3 DESIGN REQUIREMENTS

A. Design, engineer, and construct formwork, shoring, and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line, and dimension.

1.4 QUALITY CONTROL

A. Perform Work in accordance with ACI 301 and the recommendations of ACI 347.

B. Maintain one copy of each document on site.

C. Tolerance shall be as necessary to provide completed concrete structure within the tolerance specified in ACI 117.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable local County, State, and Federal building code requirements.

1.6 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. At least 14 calendar days prior to forming, submit forming plans, procedures, support system, and product data for forming concrete structures.

C. Information on formwork design and construction when specified in other Specification Sections.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Plywood: Concrete form plywood, exterior grade, mill-oiled and edge-sealed as specified herein and in accordance with APA PS-1. High-density overlaid, or provided with an equivalent smooth form liner as the minimum form material for surfaces indicated to receive smooth form finish or any rubbed finish.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surface.

C. Lumber: Fir species; No. 2 grade or better; with grade stamp clearly visible.

D. Steel: Minimum 16 gauge sheet, well matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished surfaces.

2.2 FORMWORK ACCESSORIES

A. Form Ties: Removable snap-off type, galvanized metal, fixed length, cone type, with waterproofing washer, free of defects that could leave holes larger than 1-1/4 inch (32 mm) in concrete surface.

B. Form Release Agent: Colorless, material which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

C. Corners: Chamfered, rigid plastic or wood strip, 3/4 x 3/4 inch size, maximum practical lengths.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

E. Joint Filler: A dense, closed-cell, foam rubber approved by the Engineer.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

3.2 EARTH FORMS

A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.3 ERECTION - FORMWORK

A. Erect formwork, shoring, and bracing to achieve design requirements in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight to prevent leakage of mortar. Keep form joints to a minimum.

E. Provide chamfer strips on all external corners, unless indicated otherwise.

3.4 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply form release agent prior to placement of reinforcing steel, anchoring devices and embedded items.

C. After form release agent is applied to form, place concrete within 14 calendar days. If concrete is not placed within 14 calendar days, remove forms and reapply form release agent.

D. Do not apply form release agent where concrete surfaces are scheduled to receive special finishes which may be affected by the agent such as crystal forming waterproofing. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

3.5 INSERTS, EMBEDDED PARTS AND OPENINGS

A. Provide formed openings where required for items to be embedded in or pass through concrete work.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate Work of other Sections in forming and placing openings, sleeves, bolts, anchors and other inserts.

D. Install accessories and embedded items in accordance with manufacturer's instructions, straight, level, and plumb. Secure all embedded items before placing concrete. Ensure that items are not disturbed during concrete placement. Fill voids with readily removable material to prevent entry of concrete, placed so that no voids are created in surrounding concrete.

E. Install waterstops continuous without displacing reinforcement. Heat seal joints watertight per manufacturer’s instructions.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

G. Close temporary openings with tight fitting panels, flush with inside face of forms and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

A. Clean and remove foreign matter within forms as erection proceeds.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heat enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

3.8 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that Work is in accordance with formwork design and that supports, fastenings, wedges, ties, and items are secure.

3.9 FORM REMOVAL

A. Notify Engineer at least 48 hours prior to removal of forms.

B. Remove forms in a manner which will not damage concrete.

C. Do not wedge pry bars, hammers or tools against finish concrete surfaces scheduled for exposure to view.

D. It is the Contractor's responsibility to limit construction loads at all times to those which can be carried safely by the developed strength of the structure at time of loading, and by formwork and shoring in-place at time of loading.

E. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnishing and placing deformed reinforcing steel bars, dowels, welded wire fabric, and associated accessories for cast-in-place concrete.

1.2 REFERENCES

A. American Society of Testing and Materials International (ASTM)

1.	ASTM A 185	Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
2.	ASTM A 615	Standard Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.

B. American Concrete Institute (ACI)

1.	ACI 315	Details and Detailing of Concrete Reinforcement.
2.	ACI 350	Code Requirements for Environmental Engineering Concrete and Commentary (ACI 350-06)

C. Concrete Reinforcing Steel Institute (CRSI)

1. Manual of Standard Practice.
2. Placing Reinforcing Bars.
3. Reinforcing Bar Detailing Manual.

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Reinforcement Placement Drawings: Reinforcement placement drawings for approval at least 14 calendar days prior to fabrication. Indicate bar sizes; spacings; locations and quantities of reinforcing steel and wire fabric; bending and cutting schedules; and supporting and spacing devices. Show locations of splices. Conform with Drawing structural notes, Reinforcing Bar Detailing Manual, and this Section as applicable.

C. Certified copies of mill test reports and reinforcement material analyses.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade, deformed billet steel bars.

B. Welded Steel Wire Fabric: ASTM A185 Plain Type.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions, in accordance with CRSI Manual of Standard Practice.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with ACI 315.

B. Locate reinforcing splices not indicated on Drawings at point of minimum stress. Indicate location of splices on placement drawings.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support, and secure reinforcement against displacement. Do not deviate from required position.

B. Accommodate formed openings.

C. Surface condition of reinforcement: Before placing concrete, clean reinforcement of loose rust and other substances which would impair bond with concrete. Remove rust by vigorous rubbing with burlap cloth or wire brushing.

D. Place reinforcement in accordance with the Drawings, the Contractor's reinforcing steel placement drawings and the CRSI “Placing Reinforcing Bars”.

E. See Drawings for Structural Notes, and for Reinforcement Cover Requirements.

F. Splice reinforcing bars and welded wire fabric by lapping and securely wiring together. Splices at locations other than those indicated are subject to the concurrence of the Engineer and shall conform, if permitted, to the requirements of ACI 350. Do not use mechanical splices.

3.2 QUALITY CONTROL

A. Perform concrete reinforcement work in accordance with the CRSI Manual of Standard Practice.

B. Notify the Engineer when reinforcing steel is in place and provide at least 48 hours for the Engineer to inspect the reinforcing steel prior to placement of concrete. Concrete placed without inspection may be subject to rejection and removal at no additional cost to the Owner.

C. Engineer’s inspection of steel reinforcing prior to concrete placement will not relieve the Contractor from responsibility to conform to the Drawings and Specifications.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place structural concrete at locations shown on the Drawings or directed by the Engineer.

1.2 REFERENCES

A. American Concrete Institute (ACI)

1.	ACI 117	Standard Tolerances for Concrete Construction and Materials (ACI 117) and Commentary (ACI 117R-06)
2.	ACI 301	Specification for Structural Concrete.
3.	ACI 305.1	Hot Weather Concreting.
4.	ACI 306.1	Cold Weather Concreting.
5.	ACI 308.1	Standard Specification for Curing Concrete.
6.	ACI 318	Building Code Requirements for Structural Concrete.
7.	ACI 350	Code Requirements for Environmental Concrete Structures and Commentary (ACI 350-06)

B. American Society for Testing and Materials International (ASTM)

1.	ASTM C 31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
2.	ASTM C 33	Standard Specifications for Concrete Aggregates.
3.	ASTM C 39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
4.	ASTM C 42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
5.	ASTM C 94	Standard Specifications for Ready-Mixed Concrete
6.	ASTM C 114	Standard Test Methods for Chemical Analysis of Hydraulic Cements
7.	ASTM C 138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
8.	ASTM C 143	Standard Test Method for Slump of Hydraulic Cement Concrete
9.	ASTM C 150	Standard Specifications for Portland Cement.
10.	ASTM C 171	Standard Specification for Sheet Materials for Curing Concrete.
11.	ASTM C 172	Standard Practice for Sampling Freshly Mixed Concrete
12.	ASTM C 231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
13.	ASTM C 260	Standard Specification for Air Entraining Admixtures for Concrete.
14.	ASTM C 309	Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

15.	ASTM C 441	Standard Test Method for Effectiveness of Pozzolans or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to the Alkali-Silica Reaction
16.	ASTM C 494	Standard Specification for Chemical Admixtures for Concrete.
17.	ASTM C 618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
18.	ASTM C 1017	Standard Specification for Chemical for Use in Producing Flowing Concrete
19.	ASTM C 1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
20.	ASTM C 1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
21.	ASTM C 1567	Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
22.	ASTM C 1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
23.	ASTM D 1752	Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.3 DEFINITIONS

A. Curing

1. Maintaining a satisfactory moisture content and temperature in concrete during its early stages so that the desired properties may develop.

B. Cold Weather: When air temperature has fallen to, or is expected to fall below, 40°F during the protection period.

C. Joints

1. The language regarding concrete joints in this section takes precedence over the language in the referenced American Concrete Institute Document entitled "Joints in Concrete Construction."
2. Construction Joints (CJ):

a. Construction joints are joints which are purposely placed in concrete to facilitate construction; to reduce initial shrinkage stresses and cracks; to allow time for the installation of embedded metalwork; or to allow for subsequent placing of other concrete.
b. Bond is required at construction joints regardless of whether or not reinforcement is continuous across the joint.

3. Contraction Joints (CR.J):

a. Contraction joints are joints placed in concrete to provide for volumetric shrinkage of a monolithic unit or movement between monolithic units.
b. Contraction joints are constructed so no bond exists between concrete surfaces forming the joint

c. Except as provided for dowels, reinforcement is never continuous across a contraction joint.

4. Control Joints (CT.J):

a. Control joints are joints placed in concrete to provide for control of initial shrinkage stresses and cracks of monolithic units.
b. Control joints are constructed the same as contraction joints, with the exception that reinforcement is continuous across control joints.

5. Expansion Joints (EJ):

a. Expansion joints are joints provided to allow for expansion and contraction between two adjacent concrete members.
b. Joints are filled with sponge rubber joint filler.

1.4 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Material Approval Data

1. Mix Design: For each concrete mix design submit proposed mix designs in accordance with ACI 301 for review and approval.
2. Name and manufacturer of each cementitious material, aggregate source, and admixture.

a. The Engineer reserves the right to require submission of manufacturer's test data and certification of compliance with specification.
b. The Engineer reserves the right to require submission of samples of concrete materials for testing before or during use in concrete.

3. Cementitious materials certifications and test reports:

a. Manufacturer's certification and test reports for each lot from which shipments are drawn.

1) Certify materials were tested during production or transfer in accordance with specified reference specification.
2) Submittal of certification and test reports shall not relieve Contractor of responsibility for furnishing materials meeting specified requirement.

C. Concrete Placement Drawings:

1. Drawings for each individual concrete placement. An individual concrete placement is defined as a portion of concrete Work placed in one continuous operation between specified lines or joints.
2. Show locations, dimensions, blockouts, openings, recesses, waterstops, and finishes. Identify construction joints, control joints, contraction joints and expansion joints.
3. Show details of items embedded in or associated with placement except reinforcing steel.
4. Include a separate drawing showing placement sequence.

5. Place a title block with Contractor's name, contract title and number, placement identification, and identifying drawing number in lower right hand corner of each drawing.
6. List reference drawings from which details shown on placement drawing were obtained on each drawing.
7. Reference related steel reinforcement drawings associated with placement on each drawing.

D. Concrete Placement Schedule:

1. Complete, detailed concrete placement schedule showing the Contractor's plan for placement of individual features, units, and other elements of concrete work.
2. Detail as necessary to show location, sequence, and date of concrete placements scheduled for each item of concrete work.
3. Show submittal of detail drawings and placement of reinforcement and embedded items.

E. Concrete Accessories:

1. Manufacturer data confirming conformance with this Section.
2. The Contractor shall be required to provide cold weather protection of concrete for this project. Submit specific proposed plans to cure concrete during cold weather, including work sequence, protective measures, and monitoring methods/reporting.

F. Concrete Curing Plan. The Contractor shall provide cold weather protection for this project since the concrete is anticipated to be placed during winter months. Submit specific proposed plans to cure concrete during cold weather, including work sequence, protective measures, and monitoring methods, and documentation of monitoring.

G. Hot and Cold Weather Placement Plans. Plans that do not contain sufficient detail indicating specifically how concrete will be protected against temperate extremes and damage will be rejected.

H. Batch Tickets.

I. Test Results.

1.5 QUALITY ASSURANCE AND QUALITY CONTROL

A. Include quality control required in Contractor Quality Control Plan.

B. Include provisions for hot and cold weather concrete in Contractor Quality Control plan.

C. Perform Work in accordance with provisions of all applicable ACI standards.

D. Obtain materials from same source throughout the Work.

E. Project Record Documents

1. Accurately record as-built concrete dimensions and tolerances and locations of embedded utilities and components on placement drawings.

F. Sequencing and Scheduling

1. Notify the Engineer at least 48 hours prior to commencing concrete Work.
2. Allow the Engineer to perform an immediate inspection of concrete surfaces upon removal of forms.
3. Notify the Engineer upon discovery of any honeycombing, foreign-embedded items and defective concrete.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C 150 Portland Cement, Type V;

1. Meet equivalent alkalies requirements of ASTM C 150 – Table 2.
2. Meet false-set requirement of ASTM C 150 – Table 4.

B. Pozzolan: ASTM C 618, Class F, Except,

1. Sulfur trioxide, maximum: 4.0 percent.
2. Loss on ignition, maximum: 2.5 percent.
3. Test for effectiveness in controlling alkali-silica reaction under optional physical requirements in Table 2 of ASTM C 618. Use low-alkali cement for test.
4. Does not decrease sulfate resistance of concrete by use of pozzolan.
5. Demonstrate pozzolan will have an "R" factor less than 2.5.

    a. R = (C-5)/F
    b. C: Calcium oxide content of pozzolan in percent determined in accordance with ASTM C 114.
    c. F: Ferric oxide content of pozzolan in percent determined in accordance with ASTM C 114.

6. Pozzolan when tested in accordance with ASTM C 441, shall conform to the following: 65 percent minimum reduction in mortar expansion at 14 days, and 0.02 percent maximum mortar expansion at 14 days. Expansion shall be less than control sample expansion.
7. Pozzolan content shall be 20 percent plus or minus 5 percent by weight of the total cementitious materials.
8. Pozzolan and cement shall be stored and batched separately.

C. Aggregates:

1. Fine aggregate: ASTM C 33.
2. Coarse aggregate ASTM C 33, Size No. 57 or 67.
3. Fine and coarse aggregate shall not be of a carbonate-based rock. Coarse and fine aggregates shall not contain any materials that are deleteriously reactive with the alkalis in the cement in an amount sufficient to cause excessive expansion of mortar or concrete, in accordance with ASTM C 1260 and ASTM C 1567. The amount of coal and lignite in the fine aggregate shall be less than 0.5 percent.

D. Water: Water for concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or

reinforcement in accordance with ASTM C 1602, including optional requirements of Table 2.

2.2 ADMIXTURES

A. Air Entraining Admixture:

1. ASTM C 260.
2. Use a neutralized vinsol resin formulation for air-entraining admixture used with ASTM C 494, Type F or G; and ASTM C 1017, Type I or II chemical admixtures.

B. Other Admixtures: Use only when approved and at no additional cost to the Owner. Conform to ASTM C 494:

1. Accelerators: Approval does not relax cold-weather placement requirements. Calcium chloride is prohibited.
2. Set-retarders or stabilizers: Approval does not relax hot-weather placement requirements.
3. Water reducers: Type A, D, E, F or G, to achieve workability without exceeding specified water/cement ratio and slump.
4. Mineral admixtures to be used or furnished under this Specification shall be certified to comply with this Specification by the supplier. Certification shall include test results on Specifications, source, and location.

2.3 CURING MATERIALS

A. Water: ASTM C 1602, including optional requirements of Table 2.

B. Curing Compound: ASTM C 309

C. Polyethylene Film: ASTM C171.

2.4 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C 94.

B. Select proportions for normal weight concrete in accordance with ACI 301 and ACI 350.

C. Provide concrete to the following criteria:

1. Compressive Strength (28 days): 4,500 psi concrete for all structures.
2. Slump: In accordance with ASTM C 143 - 3 inches ±1 inch at placement. For concrete with ASTM C 1017, Type I or II chemical admixtures, use slump appropriate for placing conditions, with a maximum slump of 8 inches.
3. Entrained Air: 4% to 7% at point of placement in accordance with ASTM C 231.
4. Maximum water/cementitious material ratio: 0.45.
5. Concrete temperature at placing: 50 to 80 degrees F.

D. Use accelerating admixtures in cold weather only when approved by the Engineer. Use of admixtures will not relax cold weather placement requirements.

E. Use of calcium chloride is not permitted.

F. Use set retarding admixtures during hot weather only when approved by the Engineer.

G. Use set-controlling admixtures to increase allowable concrete delivery and placement restrictions in accordance with applicable provisions of this section only when approved by the Engineer.

H. Add other approved admixtures (water reducer/superplasticizer, etc.) in accordance with the manufacturer's recommendations.

I. If a superplasticizer is used, the admixture shall be added to the concrete trucks at the site and the following requirements shall be followed:

1. The manufacturer's recommendations for dosage, mixing, and use.
2. A calibrated field dispenser shall be used. Records of dosage for each concrete truck shall be recorded by the Contractor and provided to the Engineer.
3. Each truck shall be mixed after dosing with the minimum number of drum rotations in accordance with the requirements of ACI and the admixture manufacturer.
4. Field concrete tests (air content, temperature, and slump) shall be performed on each truck before and after adding the admixture.

J. Concrete mix shall meet all specified requirements. Failure to meeting any one specified requirement shall be sufficient cause for rejection.

2.5 CONCRETE CONSOLIDATION EQUIPMENT

A. Consolidation equipment shall be flexible, electric or pneumatic-drive immersion-type vibrators with an operating speed of 7000 rpm when immersed in concrete.

2.6 SPONGE RUBBER JOINT FILLER

A. ASTM D1752, Type I, except as specified, ½ inch thickness.

B. Test Specimen Compression Load: 50 to 1500 lb/in^2.

C. Joint filler adhesive: Nonbituminous adhesive recommended by filler manufacturer.

D. Premolded sponge rubber fully compressible with recovery rate of minimum 95 percent.

2.7 CLEAR FLOOR SEALER/HARDENER

A. Sources:

1. Eucosil by Euclid Chemical Co.
2. Kure-N-Harden by BASF Building Systems.

B. Description: Colorless, inorganic silicate-based compound manufactured specifically to harden, seal and dustproof concrete surfaces.

C. Do not use sealer/hardener as curing compound. Prior to application, water cure concrete surfaces to receive sealer/hardener as specified.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joint locations conform to the approved placement drawings.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, reinforcement, embeds, openings, water stops, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

D. Verify appropriate mix design for designated placement.

E. Engineer inspection and approval of foundations is required prior to any concrete being placed. Verify with the Engineer that all surfaces on which concrete is to be placed has been inspected and is adequate for concrete placement.

F. Do not place concrete without written approval from the Engineer. Use Concrete Placement Form at the end of this Section.

3.2 PREPARATION

A. Remove standing water, ice, frost, mud, and debris from foundation, forms, and reinforcement surfaces to be covered by concrete.

B. Prepare rock horizontal or concrete surfaces free from oil, objectionable coatings, and loose, semi-detached, and unsound fragments. Immediately before placement of concrete, wash rock surfaces with an air-water jet and dry to a uniform surface-dry condition.

C. Prepare soil foundations free from frost or ice.

D. Thoroughly moisten surfaces of absorptive foundations to be covered with concrete so that moisture will not be drawn from fresh concrete.

E. Remove hardened concrete, wood chips, ice, and other debris from the interior of forms.

F. Place form release agent or wet forms just prior to placing concrete. Form release agent or any other deleterious material is not acceptable on concrete surfaces.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 304, ACI 309 and ACI 350.

B. Notify the Engineer a minimum of 48 hours prior to commencement of operations. The Engineer shall inspect all surfaces on which concrete is to be placed.

C. No concrete shall be placed until all formwork, installation of items to be embedded, and preparation of surfaces involved in the placement have been approved. Formwork and foundation surfaces on which cast-in-place concrete is placed shall be moistened and kept moist until overlying concrete is placed.

D. Place concrete in as nearly a continuous operation as practical and in a manner to produce a concrete mass with sufficient continuity and continuance so that it shall harden

and act as a monolithic mass with no discontinuous joints or potential places of separation or weakness.

E. Concrete shall be placed in near horizontal layers; the depth of each layer shall not exceed 20 inches. Place mixture on prepared foundation or previously completed concrete materials with spreading equipment that prevents segregation and that produces layers of widths and thicknesses as necessary for compaction to the required dimensions. Place each successive layer as soon as practicable after the preceding layer is completed.

F. Ensure reinforcement, inserts, embedded parts, and waterstops are not disturbed during concrete placement.

G. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

H. Deposit concrete as close as practicable to its final position. Concrete shall be placed by methods that do not cause segregation. Do not drop concrete more than 3 feet.

I. Do not retemper concrete.

J. Provide sufficient concrete placing capacity and equipment to deliver and place concrete without undue delay; do not permit cold joints to occur. Discharge concrete into forms within 90 minutes following the first introduction of water and cement or cement and aggregates, whichever occurs first. If the air temperature is 85° F or higher, the time limit specified above shall be reduced to 60 minutes unless the Engineer's approval has been obtained for means to maintain acceptable concrete quality without such time reduction.

K. Cast-in-place concrete shall not be placed during heavy rain (more than 0.3 inch per hour or 0.03 inch in 6 minutes as defined by the Weather Bureau Glossary of Meteorology). If unusual adverse weather such as heavy rain, severe cold, heavy snow, high wind, or other adverse weather occurs, or is forecast to occur during placement, an interruption in placing operations may be approved or directed. All placed concrete materials shall be fully consolidated before stopping Work. Allow for construction schedule risk and added expense that could occur as a result of adverse weather. Weather delays shall receive no additional compensation.

L. The following shall apply to concrete placements three feet thick and greater:

1. The maximum concrete placement temperature shall be 70º F.
2. Embed recording thermometers in two locations on each placement, one approximately at mid depth and one approximately 2 inches from the surface of the concrete for each concrete placement. Secure thermometers to existing rebar or other bars specifically installed to secure and protect them during concrete placement.
3. Protect the concrete surfaces with insulating blankets or heat (without causing surface drying) as needed to prevent the differential temperature between the two embedment locations from exceeding 25ºF. Monitor the temperatures twice daily to determine the differential temperature. Protection may be discontinued when the internal (midpoint) temperature is not more than 35ºF greater than the average daily temperature as recorded for the previous 3 days.

M. Consolidate concrete in accordance with ACI 309. Do not place vibrator against reinforcing or forms or use vibrator to transport concrete within forms. Have one extra

vibrator and one extra generator on site at all times during placement of concrete to be used in the event of breakdown of primary equipment. Operate vibrator to penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer. Manipulate in an up-and-down motion, generally for 5 to 15 seconds, to knit the two layers together.

N. Do not use concrete which has been subjected to more than 250 total revolutions of any combination of mixing and agitating equipment following the first introduction of aggregates to the mixer.

O. Contractor may place concrete by pumping, at Contractor's option. Appropriate mix design provisions must be included in Contractor's approved concrete submittal before any concrete is placed by pumping methods.

P. Maintain concrete cover around reinforcement in accordance with ACI 350, except where indicated otherwise on the Drawings.

Q. Place concrete continuously between predetermined construction, contraction, control and expansion joints. Do not break or interrupt successive pours such that cold joints occur.

R. Take special precautions to maintain complete concrete placement and consolidation around embedded items where continuous concrete placement cannot be confirmed visually.

S. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify the Engineer upon discovery of honeycombs or embedded debris.

T. Wait at least 5 days between adjacent placements of sections of structures with joints, including walls and slabs and before placing structural concrete over backfill concrete, unless otherwise approved by the Engineer.

3.4 CONCRETE JOINTS

A. Construction Joints:

1. Locate construction joints where shown on Drawings or approved by the Engineer in writing. Show proposed locations of construction joints on the placement Drawings. Relocation, addition, or elimination of construction joints is subject to approval by the Engineer.
2. Locate horizontal joints in walls at the tops of footings or grade slabs. Place haunches at the same time as slabs.
3. Prepare construction joint surfaces for bonding by sandblasting, steel shot blasting, or high-pressure water jetting (6,000 psi minimum), or other method approved by the Engineer to thoroughly clean the surface. Remove all laitance, loose or defective concrete, coatings, sand, curing compound, and other foreign material to expose coarse aggregate uniformly, free of laitance, loose aggregate, or damaged concrete. Roughen concrete to produce minimum roughness profile of 1/4 inch. Conduct surface preparation using methods that do not cause undercutting at the edges of the larger particles of aggregate
4. Thoroughly moisten surfaces of construction joints to be covered with fresh concrete to surface saturated dry condition and remove standing water leaving the surface damp just before concrete placement.

B. Contraction Joints:

1. Construct contraction joints so that there is no bond created between the concrete surfaces forming the joint.
2. Install waterstop in control joints where shown on the Drawings.
3. Construct contraction joints by forming the concrete on one side of the joint and allowing it to set before concrete is placed on the other side of the joint. Coat the surface of the concrete first placed at the contraction joint with curing compound, or other approved bond breaker, before the concrete on the other side of the joint is placed. Protect reinforcement and waterstop from application of curing compound so that reinforcement and waterstop does not become coated with curing compound. Furnish curing compound that conforms to the specified requirements.

C. Control joints:

1. Construct control joints using the same procedures specified for contraction joints. Coat the surface of the concrete first placed at the control joint with curing compound, or other approved bond breaker, before the concrete on the other side of the joint is placed. Protect reinforcement and waterstop from application of curing compound so that reinforcement and waterstop does not become coated with curing compound. Furnish curing compound that conforms to the specified requirements.
2. Install waterstop in control joints where shown on the Drawings.

D. Expansion Joints:

1. Structural reinforcement shall not be continuous across any expansion joint.
2. Install expansion joint filler between adjacent concrete members where an expansion joint is required in accordance with manufacturer's instructions, or shown on the Drawings.
3. Construct expansion joints by forming the concrete on one side of the joint and allowing it to set before concrete is placed on the other side of the joint. Coat the surface of the concrete first placed at the expansion joint with curing compound, or other approved bond breaker, before the joint filler is installed and the concrete on the other side of the joint is placed. Furnish curing compound that conforms to the specified requirements.

3.5 CONCRETE FINISHING

A. Finish concrete surfaces on the project as follows:

B. Formed Surfaces:

1. ACI 301 Surface Finish-3.0. Fill cracks by epoxy injection for submerged structures.

C. Unformed Surfaces:

1. Exposed: ACI 301 Trowel Finish using steel trowel, and the following:

a. Finish by screeding and floating with straightedges to bring surfaces to required finish elevation.

b. While concrete is still green but sufficiently hardened to bear a person's weight without deep imprint, wood float to true, even plane without visible coarse aggregate.
c. Use sufficient pressure on wood floats to bring moisture to surface.
d. After surface moisture has disappeared, hand trowel concrete to produce smooth, impervious surface, free from trowel marks.
e. Burnish surface with an additional troweling.
f. Final troweling to produce ringing sound from trowel.
g. Do not use dry cement or additional water during troweling, nor excessively trowel.

2. Unexposed (Buried): ACI 301 Float Finish, and the following:

a. Finish slabs by screeding with straightedges to bring surface to required finish plane.
b. Wood float finish to compact and seal surface.
c. Remove laitance and leave surface clean.
d. Coordinate with other finish procedures.

3. Slabs and Curbs:
a. Commence concrete curing of slabs immediately after final finishing so as not to damage surface.
b. Method 1: Protect surface by water ponding with water maximum 25 degrees cooler than concrete surface temperature for 7 days.
c. Method 2: Cover with burlap or cotton mats and keep continuously wet for 7 days.
d. Other approved method that will keep moisture present and uniform at all times on surface of slabs and curbs.
e. Where water curing for slabs and curbs during cold weather is not possible, and approved by the Engineer, use approved curing compound at manufacturer's recommended coverage per gallon.
f. Where curing compound cannot be used, gain approval for special methods using moisture prior to placing concrete for slabs and curbs.
g. Protect slabs during cold weather with plastic sheets or other material inside required heated enclosure if foot traffic is permitted on slabs.

D. Broomed Finish: Provide where determined by the Engineer.

1. First provide a monolithic finish as specified above, except immediately after steel troweling, then brush surface with a stiff bristle brush.
2. Brush in parallel strokes at right angles to the forms.

E. Exposed Edges:

1. Chamfer edges of permanently exposed concrete, except slabs and top edges of walls, with a 45 degree bevel ¾ inch by ¾ inch unless otherwise shown on the drawings.
2. Tool exposed edges of slabs and top edges of walls to a radius of ¼ inch unless shown otherwise on the drawings.

F. Tolerances for Concrete Construction:

1. Tolerances are defined as allowable variations from specified lines and grades, and dimensions and as the allowable magnitude of the surface irregularities. Allowable variations from specified lines, grades, and dimension shall be in accordance with ACI 301 and ACI 117

3.6 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. If a clear membrane curing compound is used, submit product information to Engineer for approval.

C. Cure and protect concrete for a minimum of 7 days as described in ACI 308.1.

D. Maintain concrete with minimal moisture loss at acceptable curing temperatures for the period necessary for proper hydration of cement and hardening of concrete. Maintain concrete at a minimum temperature of 50º F without excessive heating or excessive moisture loss for a minimum of 7 days. Provide and remove protection to control rate of temperature change per day (as required to prevent temperature cracking).

E. Use only water curing where additional finishes such as sealer/hardener, painting, and other special coatings are required.

3.7 FIELD QUALITY CONTROL

A. Furnish a batch ticket (delivery ticket) with each load of concrete. Concrete delivered without a batch ticket containing complete information as specified will be rejected. Collect and complete the batch ticket at the placement site and deliver all batch tickets to the Engineer on a daily basis. Provide Engineer access to the batch tickets at any time during the placement. Each batch ticket shall include at a minimum the following information:

1. Supplier’s name and date
2. Truck number
3. Project number and location
4. Concrete class designation and item number
5. Cubic yards batched
6. Time batched
7. Mix design number
8. Type, brand, and amount of each admixture
9. Type, brand, and amount of cement and pozzolan
10. Mass (weights) of fine and coarse aggregates
11. Moisture content of fine and coarse aggregate
12. Gallons of batch water (including ice)

B. Add the following information to the batch ticket at the placement site:

1. Gallons of water added by truck operator plus quantity of concrete in the truck each time water is added
2. Admixture additions to loads at the site including type, brand, and amount
3. Number of revolutions of drum at mixing speed (for truck mixed concrete)
4. Discharge time

5. Location of batch in placement
6. Water cement ratio

C. The Contractor will be allowed to add water to the batched concrete once at the site, based upon concrete supplier approval and direction and provided that the specified water to cement ratio is not exceeded and the amount of water withheld at the batch plant or amount of water allowed for addition is on the delivery ticket.

D. Maintain records of placed concrete items. Record truck number, date, start and stop times, location of placed concrete, quantity, air temperature, concrete placement temperature, slump, air content, admixture quantities, test samples collected and times, and cast test cylinder numbers.

E. Perform Work in accordance with ACI 301.

F. Maintain one copy of each document on site.

G. Acquire cement from same source for all Work.

H. Acquire flyash from same source for all Work.

I. Acquire aggregate from same source for all Work.

J. Conform to ACI 305.1 when concreting during hot weather.

K. Conform to ACI 306.1 and 306R when concreting during cold weather. Do not allow concrete to freeze and thaw in a saturated condition and before developing a compressive strength of at least 3500 psi. Monitor and maintain concrete temperatures during the protection period with maturity method and embedded thermometers, or other acceptable methods approved by the Engineer to demonstrate that the specified minimum strength has been achieved before protection is removed. At a minimum during cold weather concreting, maintain protection and concrete temperature above 40° F for a minimum of 7 days unless otherwise approved by the Engineer. Remove protection gradually and in a manner that does not expose concrete to thermal shock.

L. Do not place concrete directly on soil, bedrock or existing horizontal concrete surface without written approval by the Engineer that the foundation has been prepared acceptably for concrete placement.

M. Heat foundation, rebar and surfaces to receive concrete when necessary to provide acceptable placement conditions.

N. Quality Control Reporting

1. Record quality test results on the form at the end of this Section and submit to Engineer.
2. Provide test results within 24 hours for field testing, and within 48 hours of laboratory testing

3.8 CONCRETE MIX TESTING

A. Conduct quality control inspection and testing in accordance with the Standards specified in this Section using qualified personnel and Independent Testing Agency. See

Section 01450: Quality Control for Independent Testing Agency and technician requirements.

B. Provide access and samples for the Engineer's independent quality assurance testing if requested.

C. Sampling Fresh Concrete:

1. Test Method: ASTM C 172.

D. Cylinders

1. Test Method: ASTM C 31 and ASTM C 39.
2. Frequency: One set of at least 5 concrete test cylinders for each 50 or less cubic yards of concrete, at least once each day of concrete placement for each mix if different mixes are placed in the same day. The specified set of 5 cylinders does not include cylinders required for cold weather, or any additional cylinders for early breaks or other purposes. Contractor may collect additional cylinders if desired.
3. Note on Record Drawings placement location represented by cylinders.
4. Unless otherwise approved, test each set of 5 cylinders for compressive strength as follows:

    a. 2 cylinders at 7 days.
    b. 2 cylinders at 28days.
    c. 1 hold cylinder, to be retained for possible testing in the event the 28-day tests fall below the required strength.

5. Collect at least one additional test cylinder during cold weather concreting to be cured on site maintained in the same conditions as the concrete it represents up to the time it is tested. Cold weather concrete cylinders may be waived if the Contractor develops an acceptable maturity method program for determining strength.

E. Slump

1. Test Method: ASTM C 143.
2. Frequency: One per cylinder set, and at least one per truck for each mix.
3. Perform additional tests when concrete consistency appears to change.

F. Air Content, Unit Weight, and Yield

1. Test Method: ASTM C 231 and C 138.
2. Frequency: One per cylinder set, and at least one per truck for each mix.

G. Temperature

1. Test Method: ASTM C 1064.
2. Frequency: One per cylinder set, and at least one test hourly when air temperature is 40 deg F and below and when 80 deg F and above one per truck for each mix.

H. Nondestructive Testing: Impact hammer, sonoscope, or other non-destructive device may be permitted by Engineer, but will not be used as sole basis for approval or rejection of concrete.

I. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer. Additional tests shall be paid for by the Contractor at no additional expense to the Owner. Concrete in the area represented by a core test will be considered adequate if the average strength of the cores is equal to at least 90% of the specified strength f'c and if no single core is less than 85% of the specified strength f'c.

3.9 PATCHING

A. Allow the Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Honeycombing or embedded debris in concrete is not acceptable. Notify the Engineer upon discovery, and repair as determined by the Engineer.

C. Patch imperfections as directed by the Engineer.

3.10 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, levels, details, elevations, dimensions, tolerances or specified requirements. Defective concrete will be evaluated by the Engineer and repaired or replaced if directed by the Engineer at no additional cost to the Owner. See Section 03930: Concrete Repair.

B. Where concrete is considered deficient, the Engineer may require additional testing to be made at no additional expense to the Owner. If additional tests do not indicate concrete meets the requirements, Contractor may be required to remove and replace deficient concrete as directed by Engineer.

C. Nondestructive Testing: Impact hammer, sonoscope, or other non-destructive device may be permitted by the Engineer, but will not be used as sole basis for approval or rejection of concrete.

D. Additional Tests: The Contractor's independent test firm shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by the Engineer. Testing to determine adequacy of concrete may include cored cylinders in accordance with ASTM C 42 or by other methods as directed by the Engineer. Conduct additional tests at no additional expense to the Owner.

E. Repair of Hardened Concrete Not Within Specified Tolerances: Repair hardened concrete that is not within specified tolerances to bring it within tolerance. Such repair shall be accomplished in a manner approved by the Engineer. Concrete repair to bring concrete within tolerances shall be done only after consultation with the Engineer regarding the repair method. The Engineer shall be notified as to the time when repair shall be performed.

F. Repair concrete that is exposed to public view in a manner that shall result in a concrete surface with a uniform appearance. Limit grinding depth on concrete surfaces exposed to view such that no aggregate particles are exposed more than 1/6 inch in cross section at the finished surface. Where grinding has caused or shall cause exposure of aggregate particles greater than 1/6 inch in cross section at the finished surface, concrete shall be repaired by removing and replacing a portion of the concrete at no additional cost to the Owner.

G. Prevention of Repeated Failure to Meet Tolerances: When concrete placements result in hardened concrete that does not meet specified tolerances, the Contractor shall, upon request, submit to the Engineer an outline of all preventative actions, such as modifications to forms, modified procedure for setting screeds, and different finishing techniques, to be implemented by the Contractor to avoid repeated failures. The Engineer reserves the right to delay concrete placements until the Contractor implements such preventative actions that are approved by the Engineer.

H. Modify or replace concrete not conforming to required levels and lines, details, and elevations.

I. Repair or replace concrete not properly placed or not of the specified type.

3.11 PROTECTION

A. Protect finished Work under provisions of ACI 301 and as specified herein.

B. Remove formwork in accordance with the requirements in Section 03100: Concrete Formwork.

CONCRETE PLACEMENT FORM

PROJECT _____
LOCATION _____
FEATURE _____
STATION _____
_____
CONTRACTOR _____
PUMPER USED (YES/NO)? _____

DATE				
DAY	SUN	MON	TUE	WED
DAY	THU	FRI	SAT	
WEATHER	Clear	P. Cloudy	Cloudy	Fog
TEMP.	0-32°F	32-50°F	50-75°F	75-100°F
WIND	Calm	Breeze	Moderate	High
WIND DIR.	North	South	East	West
PRECIP.	Rain	Snow	Light	Moderate

CHECKOUT INFORMATION

CHECKOUT ITEM	CONTRACTOR	RPR/ENGINEER	DATE	TIME
Subgrade Preparation				
Dewatering				
Form Lines, Grades and Dimensions				
Formwork Ties and Bracing				
Reinforcing Steel				
Chamfer				
Embedded Items				
Drain Piping				
Blockouts				
Waterstops				
Placement Equipment				
Concrete Protection				
Drains Videoed				
Other (List)				
NOTE: Initial each item that is applicable; put NA (Not Applicable) if an item does not apply. All of the above shall be inspected and aproved before ordering concrete.				
Inspected and Approved		Contractor Representative and Date		
No Exceptions		Resident Project Representative or Engineer and Date		

CONCRETE MIX AND VOLUME INFORMATION

MIX	CONCRETE MIX DESIGNATION	VOLUME ORDERED (CY)	VOLUME WASTED (CY)	VOLUME SPILLED (CY)	OUT OF SPEC (CY)	OVER ORDER (CY)	VOLUME WASTED (CY)	TOTAL VOLUME PLACED (CY)
Mix 1								
Mix 2								
Mix 3								

CONCRETE TESTING INFORMATION

TRUCK #	VOLUME (CY)	TRUCK ARRIVE TIME	PLACE START TIME	PLACE END TIME	WATER ADDED (gallons)	TEMP. (°F/°C)	SLUMP (inches)	AIR CONTENT (%)	COMMENTS

NOTES: % - Percent # - Number °C - degrees Celsius CY - cubic yards °F- degrees Fahrenheit TEMP. - Temperature

END OF SECTION

DIVISION 5 – METALS

SECTION 05520
ALUMINUM HANDRAILS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes furnishing and installing aluminum handrails at the locations shown on the Drawings.

1.2 REFERENCES

A. Aluminum Association, Incorporated (AA): 45, Designation System for Aluminum Finishes.

B. American Iron and Steel Institute (AISI): SS306, Stainless Steel for Building Exteriors.

C. American Society for Testing and Materials International (ASTM)

1.	ASTM B 209	Aluminum and Aluminum-Alloy S Sheet and Plate
2.	ASTM B 221	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
3.	ASTM B 308	Aluminum-Alloy 6061-T6 Standard Structural Profiles
4.	ASTM B 429	Aluminum-Alloy Extruded Structural Pipe and Tube
5.	ASTM C 881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
6.	ASTM E 985	Permanent Metal Railing Systems and Rails for Buildings.
7.	ASTM F 593	Stainless Steel Bolts, Hex Cap Screws, and Studs.
8.	ASTM F 594	Stainless Steel Nuts.

D. International Code Council (ICC):

1. International Building Code (IBC).
2. ICC-Evaluation Service (ICC-ES) Evaluation Reports.

E. Occupational Safety and Health Act (OSHA): 29 CFR 1910, Code of Federal Regulations.

1.3 DEFINITIONS

A. Handrails: Synonymous with terms; i.e., guardrail system, railing system, ramp-rail system, and stair-rail system. Handrails are comprised of a framework of vertical, horizontal, or inclined members, grillwork or panels, accessories, or combination thereof.

B. Toeboards: Vertical barrier at floor level usually erected on handrails along exposed edges of floor or wall openings, platforms, ramps, or stairs to prevent miscellaneous items from falling through.

C. ICC-ES Evaluation Reports: Published by ICC-ES for building products manufacturers to indicate the necessary requirements for compliance with the IBC.

D. Special Inspection: As governed by the ICC IBC.

1.4 SUBMITTALS

A. Submit the following in accordance with Section 01300: Submittal Procedures.

B. Shop Drawings:

1. Indicate handrail profiles, sizes, connections, anchorage, size and type of fasteners, and accessories. Project-specific scale plans and elevations of handrails.
2. Manufacturer's literature and catalog data of handrail and components.
3. Design Data: Calculations or test data using design performance loads and include the following:

a. Bending stress in, and deflection of, posts in accordance with ASTM E 985.
b. Stress in post base connection.
c. Calculation of anchorage forces and comparison of these forces to ICC IBC recommendations regarding safe allowable design loads of anchorages.
d. For concrete anchor spacings less than 12 anchor diameters and edge distances less than six anchor diameters, make reduction in allowable pullout and shear values. Use published ICC-ES Evaluation Report values for anchors without Special Inspection; or provide independent laboratory inspection service for ICC-ES Evaluation Report values with Special Inspection.

C. Informational Submittals:

1. Manufacturer's assembly and installation instructions.
2. Special Inspection:

a. Manufacturer's instructions for Special Inspection of concrete anchors.
b. Special Inspection report in accordance with Article Tests and Inspections.

3. Manufacturer's written recommendations describing procedures for maintaining handrails including cleaning materials, application methods, and precautions to be taken in the use of cleaning materials.
4. Test Reports: Test data may supplement load calculations providing data covers the complete handrail system, including anchorage:

a. Test data for handrail and components showing load and deflection due to load, in enough detail to prove handrail is strong enough and satisfies national, state, local standards, regulations, code requirements, and OSHA 29 CFR 1910, using design loads specified. Include test data for the following:

1) Railing and post connections.
2) Railing wall connections.
3) Post and base connections.
4) Railing expansion joint connections.

5) Railing gate assembly, including latch and gate stop. Both gate latch and stop to support required loads applied, independent of each other.
6) Railing gate hinges.

b. Deflection Criteria: In accordance with ASTM E 985 and design loads specified.
c. Concrete Anchors: Calculations and test data for review prior to use, on anchors other than those specified.

1.5 QUALITY ASSURANCE

A. Qualifications: Calculations required for design data stamped by a registered engineer licensed in the state of Virginia.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handrails adequately packaged and wrapped to prevent scratching and denting during shipment, storage, and installation. Maintain protective wrapping until railing is completely installed.

B. Aluminum Handrails:

1. Shop assemble into practical modules of lengths not exceeding 24 feet for shipment.
2. Deliver toeboards loose for field assembly.
3. Deliver clear anodized handrail pipe and posts with protective plastic wrap.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Thermal Movements: Allow for thermal movement resulting from the following maximum range in ambient temperature in design, fabrication, and installation of handrails to prevent buckling, opening up of joints, over stressing of components, connections and other detrimental effects. Base design calculation on actual surface temperatures of materials due to both solar heat gain and night time sky heat loss. Temperature change is difference between high or low temperature and installation temperature.

1. Temperature Change Range: 70°F, ambient; 100°F, material surfaces.

PART 2 PRODUCTS

2.1 DESIGN PERFORMANCE

A. Structural Performance of Handrails: Design, test, fabricate, and install handrails to withstand the following structural loads without exceeding allowable design working stress or allowable deflection. Apply each load to produce maximum stress and deflection in each of the respective components comprising handrails.

1. Top Rail of Handrails: Capable of withstanding the following load cases applied:

a. Concentrated load of 200 pounds applied at any point and in any direction in accordance with ICC IBC.
b. Uniform load of 50 pounds per linear foot applied horizontally in accordance with ICC IBC.

c. Concentrated load need not be assumed to act concurrently with uniform loads in accordance with ICC IBC.

2. In-Fill Area of Railing Systems:

a. Capable of withstanding a horizontal concentrated load of 200 pounds applied to 1 square foot at any point in the system including panels, intermediate rails, balusters, or other elements composing the in-fill area.
b. Horizontal concentrated load need not be assumed to act concurrently with loads on top rails of handrails.

3. Mid-rails with corner returns to withstand a 300 pound concentrated vertical load applied at any point or direction without damage and loosening of pipe, fittings, or attachment hardware.
4. Concrete Anchors for Handrail Brackets: Anchors with a strength required by calculations with concrete strength assumed at 4,000 psi and not exceeding ICC IBC allowable loads for actual spacing, edge distance, and embedment.

2.2 ALUMINUM HANDRAILS

A. General:

1. Furnish pre-engineered and prefabricated three rail handrails.
2. Pop rivets and glued railing construction not permitted.

B. Manufacturers:

1. Thompson Fabricating Co., Birmingham, AL.
2. Moultrie Manufacturing, Moultrie, GA; Wesrail II.

C. Rails, Posts, and Formed Elbows: Extruded Alloy 6105 T5 or 6061 T6, minimum tensile strength of 38,000 psi and minimum yield strength of 35,000 psi.

1. Miscellaneous Aluminum Parts: 6063 T6 or 6061 T6 extruded aluminum of adequate strength for all loads.
2. Post and Railing:

a. Diameter: As shown on the Drawings.
b. Rails: Schedule 40.
c. Posts: Schedule 80.
d. Solid dowel interconnectors of 6105 T5 or 6061 T6 aluminum.

D. Fittings:

1. Handrail and Post Fittings: Extruded, machined bar stock, permanent mold castings, or die castings of sufficient strength to meet load requirements. Fittings shall match color of pipe in handrails. Sand cast parts not permitted.
2. Concrete Top Mount Post Base:

a. Four holes in base for concrete anchors. For narrow walls or curbs, furnish two holes in base for concrete anchors with required edge distance.
b. Manufacturers and Products:

1) Thompson Fabricating Co.; Part No. TBF 3.4 and Part No. TBF 3.2 for narrow walls and curbs.
2) Moultrie Manufacturing Co.; Part No. WII4HB and WII2HB for narrow walls and curbs

3. Concrete Side Mounted Handrail Bracket: Extruded aluminum, Alloy 6063 T6 with four holes for bolts or concrete anchors.

a. Manufacturers and Products:

1) Thompson Fabricating Co.; Part No. TSM 1.5.
2) Moultrie Manufacturing Co.; Part No. WIISMB.

4. Miscellaneous Rail to Post Fittings:

a. Aluminum Tee Fittings:

1) Manufacturers and Products:

a) Thompson Fabricating Co.; Part Nos. TF 1 and TX 1.
b) Moultrie Manufacturing Co.; Part Nos. WIIT40, WIIT40/05, WIIT80, and WIIT80/05

b. Aluminum Ell Fittings:

1) Manufacturers and Products:

a) Thompson Fabricating Co.; Part Nos. TE 1, TE 2, and TE 3.
b) Moultrie Manufacturing Co.; Part No. 51900.

c. Aluminum Splice Lock:

1) Manufacturers and Products:

a) Thompson Fabricating Co.; Part No. SL 1.
b) Moultrie Manufacturing Co.; Part No. WIIS40

d. Aluminum Expansion Joint Splice:

1) Manufacturers and Products:

a) Thompson Fabricating Co.; Part No. ES 1.
b) Moultrie Manufacturing Co.; Part No. WII40, omit set screws on one side.

e. Formed Aluminum Wall Flange:

1) Manufacturers and Products:

a) Thompson Fabricating Co.; Part No. CF 2.
b) Moultrie Manufacturing Co.; Part No. 41250.

5. Toeboards and Accessories:

a. Material: Molded or extruded 6063 or 6061 aluminum.
b. Manufacturers:

1) Thompson Fabricating Co.
2) Moultrie Manufacturing Co.; Part No. WIIKP20.

a) Castings for Handrails:

c. Cast Al mag with sufficient strength to meet load and test requirements.
d. Anodizable grade finish with excellent resistance to corrosion when subject to exposure of sodium chloride solution intermittent spray and immersion.

E. Finishes:

1. Handrail Pipe and Post: In accordance with AA 45, designation AA M32 C22 A41.
2. Cast Fittings and Toeboards: In accordance with AA 45, designation AA M10 C22 A41.

2.3 ANCHOR BOLTS, FASTENERS, AND CONCRETE ANCHORS

A. Stainless Steel Fasteners

1. Bolts: ASTM F 593.
2. Nuts: ASTM F 594.
3. Washers: ASTM F 594.

B. Stainless Steel Epoxy/Adhesive Anchors:

1. Anchor Rod and Fasteners:
   a. Stainless steel threaded rod ASTM F 593.
   b. Diameter as shown on the Drawings unless otherwise specified.
   c. Length as required to provide minimum depth of embedment shown.
   d. ASTM F 593/594 Nuts and Washers.
   e. Clean and free of grease, oil, or other deleterious material.
2. Adhesive:
   a. ASTM C 881.
   b. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.
   c. Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.
   d. Nonsag, with selected viscosity based on installation temperature and overhead application where applicable.
3. Packaging:
   a. Disposable, self-contained cartridge system capable of dispensing both components in the proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
4. Cartridge Markings: Include manufacturer's name, product name, material type, batch or serial number, and adhesive expiration date.

5. Manufacturer and Product: Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System (HIT HY-150) or approved equal.

2.4 FABRICATION OF ALUMINUM HANDRAILS

A. Shop Assembly:

1. Post Spacing: Maximum 6 foot horizontal spacing.
2. Railing Posts Bolted to Metal or Concrete:

a. In lieu of field cutting, provide approved fitting with sufficient post overlap, containing provisions for vertical adjustment.
b. Field fit-up is required.

3. Free of burrs, nicks, and sharp edges when fabrication is complete.
4. Welding is not permitted.

B. Shop/Factory Finishing:

1. Use same alloy for uniform appearance throughout fabrication for railings.
2. Handrail and Post Fittings: Match fittings with color of pipe in handrail.
3. Sand cast parts not permitted.

C. Tolerances:

1. Shop assemble rails, posts, and formed elbows with a close tolerance for tight fit.
2. Fit dowels tightly inside posts.

PART 3 EXECUTION

3.1 GENERAL

A. Provide railing posts longer than needed and field cut to exact dimensions required in order to satisfy vertical variations on the actual structure. Install railing with a base that provides plus or minus 1/4 inch vertical adjustment inside the base fitting. If adjustment is required in the field and exceeds plus or minus 1/4 inch, reduce post length not to exceed beyond bottom of lowest set-screw or bolt in base fitting.

B. Field fabrication of aluminum railing systems not permitted.

C. Modification to structure not permitted where handrail is attached.

D. Mount handrails only on completed walls. Do not support handrails temporarily by means not satisfying structural performance requirements.

3.2 HANDRAIL INSTALLATION

A. Assembly and Installation: Perform in accordance with manufacturer’s written recommendations for installation.

B. Protection from Entrapped Water:

1. Make provisions in exterior and interior installations subject to high humidity to drain water from railing system.

2. Posts mounted in concrete, bends and elbows occurring at low points, drill weep holes of 1/4 inch diameter at lowest possible elevations, one hole per post or rail. Drill hole in the plane of the rail.

C. Expansion Joints:

1. Maximum intervals of 54 feet on center and at structural joints.
2. Slip joint with internal sleeve extending 2 inches beyond each side of joint. Provide 1/2 inch slip joint gap to allow for expansion.
3. Fasten to one side using 3/8 inch diameter set-screw. Place set-screw at bottom of pipe.
4. Locate joints within 12 inches of posts. Locate expansion joints in rails that span expansion joints in structural walls and floors supporting the posts.

D. Setting Posts:

1. Surface Mounted:

a. Bolt post baseplate connectors firmly in place.
b. Shims, wedges, grout, and similar devices for handrail post alignment not permitted.

E. Posts and Rails:

1. Set posts plumb and aligned to within 1/8 inch in 12 feet.
2. Set rails horizontal or parallel to slope of steps to within 1/8 inch in 12 feet.
3. Install posts and rails in same plane. Remove projections or irregularities and provide a smooth surface for sliding hands continuously along top rail. Use offset rail for use on stairs and platforms if post is attached to web of stringers or structural platform supports.
4. Support 1 1/2 inch rails directly above stairway stringers with offset fittings.

F. Toeboard:

1. When indicated on the Drawings, or required by Code, provide at all handrails except where 4 inch or higher concrete curbs are installed or at gates.
2. Accurately measure in field for correct length, after handrail post installation, cut and secure to posts.
3. Dimension between bottom of toeboard and walking surface not to exceed 1/4 inch.
4. Aluminum Toeboards: Provide expansion and contraction connections between each post.

3.3 FIELD FINISHING

A. Corrosion Protection: Prevent galvanic action and other forms of corrosion caused from direct contact with concrete and dissimilar metals by coating surfaces as recommended by the railing manufacturer, or as approved by the Engineer.

3.4 TESTS AND INSPECTIONS

A. Perform Special Inspection for anchors where ICC-ES Evaluation Reports require them for anchor strength value used.

B. Provide an independent test laboratory to perform Special Inspection.

3.5 CLEANING

A. Wash railing system thoroughly using clean water and soap. Rinse with clean water.

B. Do not use acid solution, steel wool, or other harsh abrasive.

C. If stain remains after washing, restore in accordance with manufacturer's recommendations, or replace stained handrails.

END OF SECTION

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13500
DAM INSTRUMENTATION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Furnishing and installing embankment instrumentation piezometers.

B. Acquire all required permits for piezometer installation.

C. Existing piezometer abandonment is covered in Section 02280: Piezometer Abandonment.

1.2 REFERENCES AND DEFINITIONS

A. Piezometer: A groundwater measuring device drilled and installed with a plastic or steel casing and slotted section screened across a water-bearing zone allowing water to rise in the casing to measure the phreatic surface (water level).

1.3 SUBMITTALS

A. Submit in accordance with Section 01330: Submittals.

B. Qualifications:

1. Driller and geologist or geotechnical engineer qualifications.
2. Instrumentation Installation Supervisor.

C. Drilling Plan: Proposed plan for drilling and installation. The plan shall take into account all information furnished and all requirements imposed by the Drawings and Specifications.

D. Manufacturer's data for all materials and equipment, including the following:

1. Piezometers: PVC well casing, well screen, grout, seal, filter pack, protective surface casing and other associated materials for piezometers.

E. Completion Information

1. Piezometer As-Built Report and Drawings: Piezometer as-built construction drawings shall include, but not be limited to the following information: boring depth and diameter; casing type and depth; screen description (including material length, location, diameter, and slot size); filter pack gradation, placement method, depth and dimensions; seal placement method including material hydration time and water content; grout mixture ratios and depth; construction details, including any difficulties setting casing and screen and procedures for determining depth; manufacturer and quantities of all materials used; and borehole preparation before installation.
2. Survey data for new piezometers, including horizontal and vertical position, using the same vertical and horizontal datum as is used in development of the Drawings.

1.4 QUALITY ASSURANCE AND QUALITY CONTROL

A. Qualifications: Provide an instrumentation installation supervisor to provide direct supervision of all instrumentation work prior to starting the work. A written submittal of

qualifications is required, for the Engineer's review and approval. If, in the sole judgment of the Engineer, the instrumentation installation work is not being acceptably performed, then, at the written request of the Engineer, replace the supervisor with another qualified person approved by the Engineer. Instrumentation work not performed under the direct supervision of a qualified, approved supervisor will not be accepted by the Engineer.

B. Piezometers

1. Install piezometers in accordance with the requirements of the State of Colorado, this Section, and the Drawings.
2. Install piezometers using a driller licensed in the State of Colorado. Perform installation under the direction of an experienced, qualified, and competent geologist or geotechnical engineer approved by the Engineer.
3. Install Piezometers in the presence of the Engineer unless otherwise approved.

PART 2 PRODUCTS

2.1 PIEZOMETERS

A. PVC Well Casing: Minimum diameter and material type shown on the Drawings, flush threaded, manufactured to applicable standards, and equipped with a threaded cap at the bottom and slip cap at the top.

B. Screen: Commercially fabricated of the material type, diameter, length, and slot size shown on the Drawings, flush threaded, and manufactured to applicable standards. Field installation of screen slots is not allowed.

C. Filter Pack: Gradation and type shown on the Drawings.

D. Bentonite Seal: Sodium bentonite supplied in pellet form.

E. Water: Potable water, free of contaminants, and obtained from an off-site or on-site source approved by the Engineer.

F. Outer Protective Casing: Standard well surface casing, diameter and material type as shown on the Drawings, equipped with a hinged locking cap suitable for a padlock, and set to the depth shown on the Drawings.

G. Concrete: In accordance with Section 03300: Cast-In-Place Concrete

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify the locations and elevations that the dam and structures have been constructed to the lines and grades shown on the Drawings prior to the installation of the piezometers.

B. Verify that all piezometer bore holes have been drilled to the correct size, depth, and orientation prior to installation of instruments.

3.2 PIEZOMETER INSTALLATION

A. The Contractor is responsible for coordinating all utility locations prior to the start of any Work.

B. All downhole materials and equipment shall be clean and free of chemical contamination of any kind.

C. Protect all structures, such as roads, pipelines, existing wells, fences, and shrubbery during the Work; and shall remove from well locations all cuttings, drilling, debris, and unused materials. Restore the site to its original condition after completion of the Work. Cuttings from installation and any other debris shall be disposed of off site.

D. Install piezometers at the locations, dimensions, details, and depths shown on the Drawings unless otherwise directed by the Engineer. The Engineer may direct changes to piezometer depth, location, and screened interval based on site conditions and geology.

E. The bore hole diameter shall conform to the nominal size shown on the Drawings.

F. Do not use lubricants on downhole tools and equipment.

G. Do not use drilling fluids other than potable water during piezometer installation.

H. Drilling Equipment: The inside diameter of the drill casing or hollow-stem auger shall be sufficient to allow the installation of the specified well casing and specified thicknesses of annular materials.

I. Casing and Screen Installation:

1. Assembly: All casing and screen shall be new and in good condition before installation. All joints and other accessory parts shall be securely fastened in place. Particular care shall be exercised to avoid damaging the screen and casing during installation and throughout all subsequent operations.
2. Installation: The assembled screen and casing shall be placed in the boring to avoid jarring impacts and to ensure that the assembly is not damaged or misplaced. The well screen shall be placed in accordance with the Drawings. The casing and screen shall be suspended and centered in the boring during placement of filter pack and bentonite seal. Immediately after installation of the screen and casing, the depth shall be measured. The casing top elevation shall be determined and recorded, and the well shall be capped.
3. Alignment testing: Each completed piezometer shall be straight and plumb. No sooner than 12 hours after grout placement, alignment tests shall be conducted by the Contractor in the presence of the Engineer.
4. Alignment: Alignment tests shall consist of slowly lowering a 10-foot length of pipe to the bottom of the well. The outside diameter of the pipe shall be 0.5 inches smaller than the inside diameter of the well casing. If well misalignment results in failure of the pipe to pass freely through any part of the well casing the well shall be rejected. The Contractor shall install another piezometer adjacent to the rejected well at no additional cost to the Owner.

J. Filter Pack Placement: After the screen and casing have been installed, place the filter pack by pouring around the casing, from the bottom of the boring up, in such a manner as to ensure uniform placement around the screen. Place the filter pack in one continuous run, and in a

manner as to provide equal thickness around the outside of the casing. Periodically sound the top of the filter pack with a weighted tape to confirm that the filter pack has not bridged.

K. Bentonite and Cement-Bentonite Seal: Place the bentonite seal in the well annulus within the depth interval shown on the Drawings, and hydrate with clean water. Place cement-bentonite grout using tremie pipe into the well annulus on top of the bentonite seal. After the grout has set for a minimum of 24 hours, construct the surface completion and protective cover.

L. Capping: At all times before well completion and acceptance, maintain open borings in a manner that will not constitute a hazard to either humans or animals. Install a slip type cap on the casing to prevent extraneous material or substances from falling into the boring or casing.

M. Surface Completion: Install a protective steel casing set securely in concrete to the dimensions shown on the Drawings.

N. Survey coordinates and elevations: After completion of a piezometer, survey the location and elevations of the riser pipe, and adjacent ground surface.

O. Well Identification: Permanently number piezometers with the designation on the Drawings or as directed by the Engineer. The permanent lettering method shall be approved by the Owner and Engineer before installation.

P. Cause for New Piezometer Abandonment and Replacement:

1. Loss of a boring or other components because of lack of material, inadequate, inappropriate or faulty equipment, or careless operating procedures will be considered cause for abandonment due to fault or neglect on the part of the Contractor.
2. It is the responsibility of the Contractor to properly install all piezometers according to the requirements of this specification so that they are suitable for determining accurate groundwater levels. If the Contractor installs piezometers that are not functional or not installed in accordance with the specified requirements and Drawings, the Engineer will reject the piezometer.
3. In the event that the Engineer requires abandonment of a piezometer or borehole due to neglect of the Contractor, the Contractor shall abandon the boring or piezometer in accordance with the all applicable regulations for piezometer abandonment and install a replacement piezometer at a new location approved by the Engineer in accordance with the requirements herein.

3.3 QUALITY CONTROL

A. Observe, measure, and document installation of piezometers to assure compliance with the specified requirements. Document the details of the installation during drilling, including the depth and dimensions of each construction material such as well screen, cement-bentonite grout, gravel pack, and final boring diameter and depth; materials used; and observations. Installation information shall be documented in the installation report.

B. Survey all completed instrumentation installations and record final elevations and locations for as-constructed drawings as follows:

1. Piezometers: Top of internal and external casings.

END OF SECTION