



SET NO. _____

PROJECT MANUAL

PERMIT SET

LIFT STATION AND FORCE MAIN PROJECT

FOR THE

RIVER GLEN / RIVERSIDE FARM

LARIMER COUNTY LID 2012-1



MARCH 14, 2014

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LARIMER COUNTY LID 2012-1

JVA, Inc.
1319 Spruce Street
Boulder, CO 80302

JVA Job No. 1862.4c

March 14, 2014

PROJECT MANUAL
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LIFT STATION AND FORCE MAIN

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STATE OF COLORADO

CONSTRUCTION BIDDING REQUIREMENTS FOR
STATE REVOLVING FUND (SRF) LOAN PROJECTS

Note to Borrowers and Consulting Engineers

Colorado's Loan Programs are capitalized with federal funds, resulting in low interest rates for borrowers and a few additional requirements for general contractors. The federal requirements that follow relate to Colorado's Drinking Water and Water Pollution Control Revolving Fund Programs.

Please include this packet of requirements within the general or special provision sections of your Plans and Specifications and pay special attention to the Disadvantaged Business Enterprise (DBE) requirements. DBE requirements are only applicable to projects funded with federal dollars. If you are unsure whether your project must comply with the DBE requirements, contact your project manager.

To emphasize the DBE requirements please include the following sentence in your Instructions to Bidders:

"This contract is subject to, and bidders attention is called to the Disadvantaged Business Enterprise Program (DBE), as described in Section I."

The Water Quality Control Division Grants and Loans Unit project managers listed below are available to answer your questions regarding these requirements.

Unit Manager:

Michael Beck – (303) 692-3374 (michael.s.beck@state.co.us)

Project Managers:

Erick Worker – (303) 692-3594 (erick.worker@state.co.us)

Louanna Cruz – (303) 692-3604 (louanna.cruz@state.co.us)

Corrina Quintana– (303) 691-4025 (corrina.quintana@state.co.us)

Margaret Pauls – (303) 692-3290 (margaret.pauls@state.co.us)

Bradley Monson – (303) 692-2286 (bradley.monson@state.co.us)

Richard Markovich – (303) 691-4051 (richard.markovich@state.co.us)

Compliance Specialist:

Matthew Stearns–(303) 691-4064 (matthew.stearns@state.co.us)

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1. Buy American Requirements

Section I – Compliance

1. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

A. INSTRUCTIONS

Under Executive Order 12549, an individual or organization debarred or excluded from participation in Federal assistance or benefit programs may not receive any assistance award under a Federal program, or a subagreement thereunder for \$25,000 or more.

The status of prospective individuals or organizations can be checked at <http://www.sam.gov> it is the recipients' responsibility to verify the awarded contractor is not on the excluded parties list. It is the prime contractor's responsibility to verify subcontractors, vendors, suppliers and manufacturers are not on the excluded parties list.

Accordingly, each prospective recipient of an EPA grant, loan, or cooperative agreement and any contract or sub-agreement participant thereunder must complete the attached certification or provide an explanation why they cannot complete the certification. For further details, see 40 CFR 32.510, Participants Responsibilities.

B. WHERE TO SUBMIT

A prospective prime contractor must submit a completed certification or explanation to the project owner for the project. Each prospective subcontractor must submit a completed certification or explanation to the prime contractor for the project.

C. HOW TO OBTAIN FORMS

Additional forms may be obtained from the State and may be reproduced. Additional assistance is available from the State if needed.

SRF Project Number

United States Environmental Protection Agency
Washington, DC 20460
**Certification Regarding
Debarment, Suspension, and Other Responsibility Matters**

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- (b) Have not within a three year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- (c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
- (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to \$10,000 or imprisonment for up to 5 years, or both.

Typed Name & Title of Authorized Representative

Signature of Authorized Representative

Date

_____ I am unable to certify to the above statements. My explanation is attached.

2. PROHIBITION AGAINST LISTED VIOLATED FACILITIES

A. REQUIREMENTS

(1) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by Pub. L. 92-604) and section 308 of the Clean Water Act (33 U.S.C. 1251, as amended), respectively, which relate to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this contract.

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency list of violating facilities on the date when this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from the listing.

(3) To use his best efforts to comply with clean air and clean water standards at the facilities in which the contract is being performed.

(4) To insert the substance of the provisions of this clause, including this paragraph (4), in any nonexempt subcontract.

B. DEFINITIONS

(1) Air Act means the Clean Air Act, as amended (42 U.S.C. 1857 et seq.).

(2) Water Act means the Clean Water Act, as amended (33 U.S.C. 1251 et seq.).

(3) Clean Air Standards means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110 (d) of the Air Act (42 U.S.C. 1857c-5(d)), an approved implementation procedure or plan under section 111 (c) or section 111(d), or an approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 1857c-7(d)).

(4) Clean Water Standards means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated under the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by a local government to ensure compliance with pretreatment regulations as required by section 307 of Water Act

(33 U.S.C. 1317).

(5) Compliance means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency in accordance with the requirements of the Air Act or Water Act and regulations.

(6) Facility means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor or subcontractor, to be used in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are located in one geographical area.

Section II - Construction

1. WILLIAMS-STEIGER OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

A. AUTHORITY

(1) The contractor is subject to the provisions of the Williams-Steiger Occupational Safety and Health Act of 1970.

(2) These construction documents and the joint and several phases of construction hereby contemplated are to be governed, at all times, by applicable provisions of the Federal law(s) , including but not limited to the latest amendment of the following:

a. Williams-Steiger Occupational Safety and Health Act of 1970, Public Law 94-596;

b. Part 1910 - Occupational Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations;

c. Part 1926 - Safety and Health Regulations for Construction, Chapter XVII of Title 29, Code of Federal Regulations.

B. SAFETY AND HEALTH PROGRAM REQUIREMENTS

(1) This project, its prime contractor and its subcontractors, shall at all times be governed by Chapter XVII of Title 29, Code of Federal Regulations, Part 1926 - Safety and Health Regulations for Construction (29 CFR 22801), as amended to date.

(2) To implement the program and to provide safe and healthful working conditions for all persons, general project safety meetings will be conducted at the site at least once each month during the course of construction, by the construction superintendent or his/her designated safety officer. Notice of such meeting shall be issued not less than three (3) days prior, stating the exact time, location, and agenda to be included. Attendance by the owner, architect, general foreman, shop steward(s), and trades, or their designated representatives, witnessed in writing as such, shall be mandatory.

(3) To further implement the program, each trade shall conduct a short gang meeting, not less than once a week, to review project safety requirements mandatory for all persons during the coming week. The gang foreman shall report the agenda and specific items covered to the project superintendent, who shall incorporate these items in his/her daily log or report.

(4) The prime contractor and all subcontractors shall immediately report all accidents, injuries, or health hazards to the owner and architect, or their designated representatives, in writing. This shall not obviate any mandatory reporting under the provisions of the Occupational Safety and Health Act of 1970.

(5) This program shall become a part of the contract documents and the contract between the owner and prime contractor, prime contractor and all subcontractors, as though fully written therein.

2. DISCOVERY OF ARCHAEOLOGICAL AND OTHER HISTORICAL ITEMS

A. CONSTRUCTION PROCEDURES

In the event of an archaeological or more recent historical find (e.g., artifacts, housing sites) during any phase of construction, the following procedure should be followed:

(1) Construction shall be halted, with as little disruption to the archaeological site as possible.

(2) The Contractor shall notify the Owner who shall contact the State Historical Preservation Officer.

(3) The State Historical Preservation Officer may decide to have an archaeologist inspect the site and make recommendations about the steps needed to protect the site, before construction is resumed.

(4) The entire event should be handled as expediently as possible in order to hold the loss in construction time to a minimum while still protecting archaeological finds.

B. NATIONAL REGISTER STATUS

In the event archaeological/historical data are evaluated to meet National Register criteria, the Advisory Council on Historic Preservation may be notified and asked to comment by the Water Quality Control Division.

Section III – Davis-Bacon

1. Davis-Bacon (DB) Act Wage Rate Requirements:

All Contracts and subcontracts for the construction of treatment works carried out in whole or in part with assistance made available through the State Water Pollution Control Revolving Fund (WPCRF) or Drinking Water Revolving Fund (DWRP) shall insert in full in any contract in excess of \$2,000 the contract clauses as attached entitled “**Wage Rate Requirements.**”

Wage Rate Requirements

Preamble

With respect to the WPCRF and DWSRF Funds, the Environmental Protection Agency (EPA) provides capitalization grants to each State which in turn provides sub-grants or loans to eligible entities within the State. Typically, the sub-recipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman Number I, below, shall apply. Although EPA and the State remain responsible for ensuring sub-recipients’ compliance with the wage rate requirements set forth herein, those sub-recipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Sections 1-5.

I. Requirements For Sub-recipients That Are Governmental Entities:

The following terms and conditions specify how recipients and sub-recipients will assist EPA in meeting its DB responsibilities where DB applies to EPA awards of financial assistance under the WPCRF and DWSRF Appropriations with respect to State recipients and sub-recipients that are governmental entities. If a sub-recipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact Matthew Stearns at 303-691-4064 or via email at matthew.stearns@state.co.us or matthew.stearns@state.co.us for guidance. The sub-recipient may also obtain additional guidance from DOL’s web site at <http://www.dol.gov/compliance/laws/comp-dbra.htm>.

1. Applicability of the Davis-Bacon (DB) prevailing wage requirements

Davis-Bacon prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by WPCRF or DWSRF and to any construction project carried out in whole or in part by assistance made available by a SRF loan. If a sub-recipient encounters a unique situation

at a site that presents uncertainties regarding DB applicability, the sub-recipient must discuss the situation with the State before authorizing work on that site.

2. Obtaining Wage Determinations

a) Sub-recipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract. Wage determinations can be found at www.wdol.gov.

(i) While the solicitation remains open, the sub recipient shall monitor www.wdol.gov weekly to ensure that the wage determination contained in the solicitation remains current. The sub-recipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the sub-recipients may request a finding from the State that there is not a reasonable time to notify interested contractors of the modification of the wage determination . The State will provide a report of its findings to the sub recipient.

(ii) If the sub-recipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State, at the request of the sub-recipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The sub-recipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(iii) Please see **Colorado SRF Programmatic Requirements** below for referencing General Decision Numbers in all bid solicitations and any subsequent construction contracts.

b) If the sub-recipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the sub-recipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

c) Sub-recipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

d) As provided in 29 CFR 16.1 (f), DOL may issue a revised wage determination applicable to a sub-recipient's contract after the award of a contract or the issuance of an

ordering instrument if DOL determines that the sub recipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the sub-recipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The sub-recipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract Provisions

(a) The Recipient shall insure that the sub recipients shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated) and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2010 appropriation , the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part3)) the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period , are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional

classification and wage rates conformed under paragraph (a)(1)(ii) of this section and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. Sub recipients may obtain wage determinations from the U.S. Department of Labor's web site, www.wdol.gov

(ii)(A) The sub recipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the sub recipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the sub-recipient(s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the sub-recipients(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The sub-recipient(s) shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of (the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR (5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain

records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the sub recipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the sub recipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the sub recipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records without weekly submission to the sub-recipient(s).

B) Each payroll submitted shall be accompanied by a "Statement of Compliance" signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR Part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29CFR Part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4) Apprentices and trainees--

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage

determination for the classification of work actually performed . In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered , the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the Apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval , evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeymen wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5 (a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Sub-recipient(s) State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C 1001.

4. Contract Provision for Contracts in Excess of \$100,000.

(a) Contract Work Hours and Safety Standards Act. The sub recipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of 100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The sub recipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Sub-recipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics , including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Sub recipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the loan recipient, CDPHE, EPA and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The sub recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The sub-recipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The sub recipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the sub recipient should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Sub recipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Sub-recipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c) The sub-recipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The sub recipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the sub recipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Sub recipients must conduct more frequent

spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the sub recipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The sub recipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Sub-recipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/esa/contacts/whd/america2.htm>.

Colorado SRF Programmatic Requirements

The general decision number will need to be referenced and included in all bid solicitations and subsequent contracts (i.e. signed construction agreement). Simply inserting a copy of the wage determination, with or without reference, does not “lock-in” the wages nor does it fulfill the requirement of loan agreement. The General Decision Number (i.e. CO120013; 10/26/12; CO13) **MUST** be noted in body of the signed contract agreement(s) that has been signed by all parties. Please contact Matthew Stearns at 303-691-4064 or matthew.stearns@state.co.us if you have further questions.

Davis-Bacon applies only to laborers and mechanics employed “directly upon the site of the work.”

Laborers and Mechanics:

Workers whose duties are manual or physical in nature, includes apprentices, trainees and helpers

Exemptions:

- As a general rule, an employee who spends the majority of time in a supervisory position at the job site, and who spends less than 20% of the work week engaged in skilled labor, is exempt from Davis-Bacon requirements for the percentage of time spent in that skilled time.
- Clerical staff such as timekeepers; professionals such as architects, engineers; and inspectors.
- Force Account workers, prisoners, volunteers are generally exempt, except when contractor is non governmental

Debarment/Suspension:

- Verify prime contractor and all subcontractor eligibility against GSA Debarment List (On-line access at: <https://sam.gov>)
- Make record of verification to contract file
- Bid/contract documents (including RFPs) must contain:
 - Applicable Davis-Bacon Wage Determination (WD)

Determine the type of construction (serves as the basis for prevailing wage classification)

- **Residential** - single family houses, townhouses, and apartment buildings up to four stories
- **Building** - sheltered enclosures with walk-in access for the purpose of housing persons, machinery, equipment, or supplies. Also apartment buildings greater than 4 stories, parking garages, service stations, office buildings, fire stations, etc.
- **Highway** - roads, streets, highways, sidewalks, runways, parking areas, and other paving work not incidental to other construction
- **Heavy** - those projects, generally public works, which cannot be classified as Residential, Building, or Highway Construction
 - Often distinguished on the basis of the characteristics of particular projects such as dredging, water and sewer lines, parks and playgrounds, dams, major bridges, and flood control.

Wage Determination:

- There may be instances that certain classes (trades) may be missing from the wage determination that will be utilized on the project. In such case, Standard Form (SF)-1444 will need to be submitted for DOL review and final rule after award of contract.
- If virtually all the work is to be performed by a missing classification, use Standard Form (SF) 308 to request an appropriate predetermined wage rate for incorporation in the bid specifications. This form is to be used during the pre-bid/pre-award phase of the project.

In either case as defined above, SF-1444 or SF-308 will need to be completed and submitted to:

Colorado Department of Public Health and Environment
Matthew Stearns
Compliance Specialist
WQCD-GLU-B2
4300 Cherry Creek Drive South
Denver, CO 80246

Wage Determination “Lock-In” Rules:

- Competitive bidding: Modifications published less than 10 days before bid opening may be disregarded if found there is not sufficient time to notify bidders, and a report is made to contract file
- Lock-in at bid opening provided contract is awarded within 90 days

- Must update wage determination if contract award is more than 90 days after bid opening
- Once a Davis-Bacon wage rate has been “locked,” it stays in effect for the duration of the project. Please note: In order to accurately “lock” in a wage determination, the General Decision Number (i.e. CO120013; 10/26/12; CO13) **MUST** be noted in body of the signed contract agreement(s) that has been signed by all parties. Simply referencing an attachment or attaching the published wage determination without reference does not “lock” in the wage determination.

Notice:

- The locked-in published prevailing wage determination(s) must be posted at the site of work in an accessible place for all employees to review. In addition, standard form WH-1321 (English and Spanish) must also be posted at the site of work in an accessible place notifying all employees of their rights under the Davis-Bacon Act.

Interviews

- In order to ensure compliance, the sub-recipient must conduct periodic interviews. The interviews should be inclusive of the prime and subcontractor’s mechanics/laborers as identified on the weekly submitted certified payrolls. The interviews should include a good representative sample to provide another perspective of the employer’s performance with respect to the Davis-Bacon Act and will provide a means to test the accuracy of the payroll reports. SF-1445 should be utilized and maintained in the appropriate file.

Reporting:

- The SRF Program Davis-Bacon Act Certification form will need to be submitted to the state certifying that the project complied with the Davis-Bacon Act for the period in which payment is being requested. Please do **NOT** submit copies of the certified payrolls to the state.
- Certified payrolls must be maintained by the loan recipient and contractor during the course of the work and preserve them for a period of three years after final completion. These documents will be audited at the final inspection of the project.

REQUEST FOR AUTHORIZATION OF ADDITIONAL CLASSIFICATION AND RATE

CHECK APPROPRIATE BOX

☐ SERVICE CONTRACT☐ CONSTRUCTION CONTRACT

OMB Number: 9000-0089

Expiration Date: 7/31/2014

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (MVP), Office of Acquisition Policy, GSA, Washington, DC 20405; and to the Office of Management and Budget, Paperwork Reduction Project (9000-0089), Washington, DC 20503.

INSTRUCTIONS: THE CONTRACTOR SHALL COMPLETE ITEMS 3 THROUGH 16, KEEP A PENDING COPY, AND SUBMIT THE REQUEST, IN QUADRUPPLICATE, TO THE CONTRACTING OFFICER.

1. TO: ADMINISTRATOR, Employment Standards Administration WAGE AND HOUR DIVISION U.S. DEPARTMENT OF LABOR WASHINGTON, D.C. 20210		2. FROM: (REPORTING OFFICE)		
3. CONTRACTOR				4. DATE OF REQUEST
5. CONTRACT NUMBER	6. DATE BID OPENED (SEALED BIDDING)	7. DATE OF AWARD	8. DATE CONTRACT WORK STARTED	9. DATE OPTION EXERCISED (IF APPLICABLE) (SCA ONLY)
10. SUBCONTRACTOR (IF ANY)				

11. PROJECT AND DESCRIPTION OF WORK (ATTACH ADDITIONAL SHEET IF NEEDED)

12. LOCATION (CITY, COUNTY AND STATE)

13. IN ORDER TO COMPLETE THE WORK PROVIDED FOR UNDER THE ABOVE CONTRACT, IT IS NECESSARY TO ESTABLISH THE FOLLOWING RATE(S) FOR THE INDICATED CLASSIFICATION(S) NOT INCLUDED IN THE DEPARTMENT OF LABOR DETERMINATION

NUMBER:

DATED:

a. LIST IN ORDER: PROPOSED CLASSIFICATION TITLE(S); JOB DESCRIPTION(S); DUTIES; AND RATIONALE FOR PROPOSED CLASSIFICATIONS (SCA ONLY) <small>(Use reverse or attach additional sheets, if necessary)</small>	b. WAGE RATE(S)	c. FRINGE BENEFITS PAYMENTS

14. SIGNATURE AND TITLE OF SUBCONTRACTOR REPRESENTATIVE (IF ANY)	15. SIGNATURE AND TITLE OF PRIME CONTRACTOR REPRESENTATIVE	
16. SIGNATURE OF EMPLOYEE OR REPRESENTATIVE	TITLE	CHECK APPROPRIATE BOX-REFERENCING BLOCK 13: <input type="checkbox"/> AGREE <input type="checkbox"/> DISAGREE

TO BE COMPLETED BY CONTRACTING OFFICER (CHECK AS APPROPRIATE - SEE FAR 22.1019 (SCA) OR FAR 22.406-3 (DBA))

- ☐ THE INTERESTED PARTIES AGREE AND THE CONTRACTING OFFICER RECOMMENDS APPROVAL BY THE WAGE AND HOUR DIVISION. AVAILABLE INFORMATION AND RECOMMENDATIONS ARE ATTACHED.
- ☐ THE INTERESTED PARTIES CANNOT AGREE ON THE PROPOSED CLASSIFICATION AND WAGE RATE. A DETERMINATION OF THE QUESTION BY THE WAGE AND HOUR DIVISION IS THEREFORE REQUESTED. AVAILABLE INFORMATION AND RECOMMENDATIONS ARE ATTACHED.

(Send copies 1, 2, and 3 to Department of Labor)

SIGNATURE OF CONTRACTING OFFICER OR REPRESENTATIVE	TITLE AND COMMERCIAL TELEPHONE NO.	DATE SUBMITTED
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PREVIOUS EDITION IS USABLE

STANDARD FORM 1444 (REV. 12-2001)
Prescribed by GSA-FAR (48 CFR) 53.222(f)

Request For Wage Determination And Response To Request

(Davis Bacon Act as Amended and Related Statutes)

U.S. Department of Labor

Employment Standards Administration
Wage and Hour Division



FOR DEPARTMENT OF LABOR USE Response To Request <input type="checkbox"/> Use area determination issued for this area _____ _____ <input type="checkbox"/> The attached decision noted below is applicable to this project Decision Number: _____ Date of Decision: _____ Expires: _____ Supersedes Decision Number: _____ Approved: _____	Mail Your Request To: U.S. Department of Labor Employment Standards Administration Wage and Hour Division Branch of Construction Contract Wage Determinations Washington, D.C. 20210			CHECK OR LIST CRAFTS NEEDED (Attach continuation sheet if <i>needed</i>) <input type="checkbox"/> Asbestos workers <input type="checkbox"/> Boilermakers <input type="checkbox"/> Bricklayers <input type="checkbox"/> Carpenters <input type="checkbox"/> Cement masons <input type="checkbox"/> Electricians <input type="checkbox"/> Glaziers <input type="checkbox"/> Ironworkers <input type="checkbox"/> Laborers (Specify classes) _____ _____ _____ _____ <input type="checkbox"/> Lathers <input type="checkbox"/> Marble & tile setters, terrazzo workers <input type="checkbox"/> Painters <input type="checkbox"/> Piledriversmen <input type="checkbox"/> Plasterers <input type="checkbox"/> Plumbers <input type="checkbox"/> Roofers <input type="checkbox"/> Sheet metal workers <input type="checkbox"/> Soft floor layers <input type="checkbox"/> Steamfitters <input type="checkbox"/> Welders-rate for craft <input type="checkbox"/> Truck drivers <input type="checkbox"/> Power equipment operators (Specify types) _____ _____ _____ _____ _____ _____ Other Crafts _____ _____ _____ _____
	Requesting Officer (Typed name and signature)			
	Department, Agency, or Bureau		Phone Number	
	Date of Request	Estimated Advertising Date	Estimated Bid Opening Date	
	Prior Decision Number (If any)	Estimated \$ Value of Contract <input type="checkbox"/> Under 1/2 Mil <input type="checkbox"/> 1 to 5 Mil <input type="checkbox"/> 1/2 to 1 Mil <input type="checkbox"/> Over 5 Mil	Type of Work <input type="checkbox"/> Bldg. <input type="checkbox"/> Highway <input type="checkbox"/> Resid. <input type="checkbox"/> Heavy	
	Address to which wage determination should be mailed. (Print or type)			
	<div style="border: 1px solid black; height: 100px; width: 100%;"></div>			
	Location of Project (City, County, State, Zip Code)			
	Description of Work (Be specific) (Print or type)			



Colorado Department
of Public Health
and Environment

Project Name: _____

Period From: _____ To: _____

Davis-Bacon Act CERTIFICATION

I certify to the best of my knowledge and belief that the above referenced project:

Complies with Davis-Bacon and Related Acts and that all laborers and mechanics employed by contractors and subcontractors during the above referenced period were paid wages at rates not less than those listed on the prevailing wage rate contained in the contract documents and that all applicable provisions of the Davis-Bacon and Related Acts have been met.

Name of Loan Recipient

Date

Signature of Authorized Official

Print Name and Title of Authorized Official

PAYROLL
(For Contractor's Optional Use; See Instructions at www.dol.gov/esa/whd/forms/wh347instr.htm)

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

NAME OF CONTRACTOR <input type="checkbox"/> OR SUBCONTRACTOR <input type="checkbox"/>	ADDRESS	OMB No.: 1215-0149 Expires: 12/31/2011
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PAYROLL NO.	FOR WEEK ENDING	PROJECT AND LOCATION	PROJECT OR CONTRACT NO.
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(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT OR ST	(4) DAY AND DATE HOURS WORKED EACH DAY	(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS					(9) NET WAGES PAID FOR WEEK
								FICA	WITH- HOLDING TAX		OTHER	TOTAL DEDUCTIONS	
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, ESA, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W., Washington, D.C. 20210

(over)

LABOR STANDARDS INTERVIEW

CONTRACT NUMBER			EMPLOYEE INFORMATION		
NAME OF PRIME CONTRACTOR			LAST NAME	FIRST NAME	MI
NAME OF EMPLOYER			STREET ADDRESS		
SUPERVISOR'S NAME			CITY	STATE	ZIP CODE
LAST NAME	FIRST NAME	MI	WORK CLASSIFICATION	WAGE RATE	

ACTION	CHECK BELOW	
	YES	NO
Do you work over 8 hours per day?		
Do you work over 40 hours per week?		
Are you paid at least time and a half for overtime hours?		
Are you receiving any cash payments for fringe benefits required by the posted wage determination decision?		

WHAT DEDUCTIONS OTHER THAN TAXES AND SOCIAL SECURITY ARE MADE FROM YOUR PAY?		
HOW MANY HOURS DID YOU WORK ON YOUR LAST WORK DAY BEFORE THIS INTERVIEW?	TOOLS YOU USE	
DATE OF LAST WORK DAY BEFORE INTERVIEW (YYMMDD)		
DATE YOU BEGAN WORK ON THIS PROJECT (YYMMDD)		

THE ABOVE IS CORRECT TO THE BEST OF MY KNOWLEDGE			
EMPLOYEE'S SIGNATURE			DATE (YYMMDD)
INTERVIEWER	SIGNATURE	TYPED OR PRINTED NAME	DATE (YYMMDD)

INTERVIEWER'S COMMENTS			
WORK EMPLOYEE WAS DOING WHEN INTERVIEWED	ACTION (If explanation is needed, use comments section)	YES	NO
	IS EMPLOYEE PROPERLY CLASSIFIED AND PAID?		
	ARE WAGE RATES AND POSTERS DISPLAYED?		

FOR USE BY PAYROLL CHECKER	
IS ABOVE INFORMATION IN AGREEMENT WITH PAYROLL DATA?	
<input type="checkbox"/> YES	<input type="checkbox"/> NO
COMMENTS	

CHECKER				
LAST NAME	FIRST NAME	MI	JOB TITLE	
SIGNATURE				DATE (YYMMDD)

Section IV – Subcontracting

NOTE: This section is only required if the project's loan exceeds \$2,000,000. If you have questions concerning DBE please contact your WQCD GLU Project Manager.

1. OVERVIEW OF DISADVANTAGED BUSINESS ENTERPRISE UTILIZATION

Disadvantaged Business Enterprise (DBE)

The Environmental Protection Agency's (EPA) new Disadvantaged Business Enterprise (DBE) rule became effective on May 27, 2008. The new DBE rule sets forth an EPA program that serves the compelling government interest of remedying past and current racial discrimination through agency-wide procurement objectives. The new DBE rule revises and replaces EPA's Minority and Women Business Enterprise (MBE/WBE) Program for funding received after May 27, 2008.

The implementation of the new DBE Rule (40 CFR Parts 30, 31, 33, 35, and 40) adds additional contract administration requirements to a SRF loan recipient. This document summarizes those requirements.

Note that the loan recipient is not a passive conduit of the contractor's DBE information. By submitting the proposed contractor's DBE documentation to the SRF Loan Program for review, the loan recipient is asserting that it has found the proposed contractor's documentation of good faith efforts adequate.

In order to be counted as a MBE/WBE under the new EPA DBE rule, MBE/WBEs must be certified by a federal agency (e.g., EPA, Small Business Administration, Department of Transportation) or by a State, locality, Indian Tribe, or independent private organization that meets the certification requirements of the new EPA DBE rule. Under the new EPA DBE rule an individual claiming economic disadvantaged status must have an initial and continued personal net worth of less than \$750,000.

Locating potential DBE sub-contractors is the responsibility of the bidder/contractor. The Colorado Department of Transportation does maintain a listing of some certified DBE'S on its website at <http://coloradodbe.org/>

Applications for certification by EPA can be found on EPA's Small Business Programs website at http://www.epa.gov/osbp/dbe_fair.htm under Certification Forms.

1. Each procurement contract signed by a loan participant must include the following term and condition:

“The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a

Last Revised: 01/28/2014

material breach of this contract which may result in the termination of this contract.” (Appendix A to Part 33—Term and Condition)

2. All loan recipients will be required by EPA to create and maintain a “Bidders List”.
 - a. This list must include all firms that bid on prime contracts, or bid or quote on subcontracts under EPA assisted projects, including both MBE/WBEs and non-MBE/WBEs.
 - b. This list must be kept until the project period for the identified loan has ended. The project period is defined as the timeframe that the loan participant receives SRF funding.
 - c. The following information must be obtained from all prime and subcontractors:
 - (1) Entity’s name with point of contact.
 - (2) Entity’s mailing address, telephone number, and email address
 - (3) The procurement on which the entity bid or quoted, and when, and;
 - (4) Entity’s status as an MBE/WBE or non-MBE/WBE
 - d. The loan recipient must send a copy of the Bidder’s List to the Financial Solutions Unit project manager.
3. Following are the new Contract Administration Provisions:
 - a. A loan recipient must require its prime contractor to pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor’s receipt of payment from the loan recipient.
 - b. A loan recipient must be notified in writing by its prime contractor prior to any termination of a DBE subcontractor for convenience by the prime contractor.
 - c. If a DBE subcontractor fails to complete work under the subcontract for any reason, the loan recipient must require the prime contractor to employ the Six Good Faith Efforts (described below) if soliciting a replacement subcontractor.
 - d. A loan recipient must require its prime contractor to employ the Six Good Faith Efforts even if the prime contractor has achieved its fair share objectives.

Six Good Faith Efforts

1. Use the services and assistance, as appropriate, of such organizations as the U.S. Small Business Administration and the Office of Minority Business Enterprise of the U.S. Department of Commerce in the solicitation and utilization of small businesses, minority-owned firms, and women’s businesses.
2. Include qualified small and minority and women's businesses on solicitation lists.
3. Ensure that small and minority and women's businesses are solicited whenever they are potential sources of products or services to be bid.
4. Divide total requirements, when economically feasible, into small tasks or

quantities to permit maximum participation by small and minority and women's business (i.e., provide alternative bidding scenarios).

5. Establish delivery schedules, where the requirements of the work permit, which will encourage participation by small and minority and women's businesses (i.e., timing and flexibility).
6. Require each party to a sub-agreement to take the affirmative steps outlined in items one through five of this section.

2. EPA GUIDANCE FOR UTILIZATION OF MINORITY AND WOMEN BUSINESS ENTERPRISES OF 40 CFR §35.3145(d)

A. REQUIREMENTS – SIX ACTION STEPS (a-f)

(1) The recipient and prime contractor will exercise good faith efforts, as described in section B. 11, to attract and utilize small, minority, and women's business enterprises primarily through outreach, recruitment, and race/gender neutral activities; at a minimum, fulfillment of the six affirmative steps set forth below:

- a. Including small, minority and women's businesses on solicitation lists;
- b. Assuring that small, minority and women's businesses are solicited whenever they are potential sources;
- c. Dividing total requirements, when economically feasible, into small tasks or quantities to permit maximum participation by small, minority and women's businesses;
- d. Establishing delivery schedules, when the requirements of the work permit, which will encourage participation by small, minority and women's businesses;
- e. Using the services of the Small Business Administration and the Office of Minority Business Enterprise of the U.S. Department of Commerce, as appropriate; and
- f. Require a. through e. to be taken if subcontracts are awarded.

B. FAIR SHARE OBJECTIVE

1. The SRF project goals are:

SRF Project	% MBE's	% WBE's
Construction	6.1%	6.6%

No fair share objectives are established for small businesses.

C. DEFINITIONS

1. Minority Business Enterprise (MBE) is a business concern which is:

- a. Certified as socially and economically disadvantaged by the Small Business Administration;
 - (i) Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities.
 - (ii) Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system is impaired due to diminished capital and credit opportunities, as compared to others in the same business area who are not socially disadvantaged. In determining the degree of diminished credit and capital opportunities, the Small Business Administration shall consider, but not be limited to, the assets and net worth of such socially disadvantaged individuals. Individuals who certify that they are members of named groups (Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Asian-Indian Americans), are to be considered socially and economically disadvantaged. Economically and socially disadvantaged individuals are deemed to include women.
- b. Certified as a minority business enterprise by a State or Federal agency; or
- c. An independent business concern which is at least 51 percent owned and controlled by minority group member(s).
 - (i) A minority group member is an individual who is a citizen of the United States and one of the following:
 - (a) Black American;

(b) Hispanic American (with origins from Puerto Rico, Mexico, Cuba, South or Central America)

(c) Native American (American Indian, Eskimo, Aleut, native Hawaiian); or

(d) Asian-Pacific American (with origins from Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, the U.S. Trust Territories of the Pacific, Northern Marianas, Laos, Cambodia, Taiwan or the Indian subcontinent).

(ii) In order to satisfy this third criteria of the MBE definition, the minority ownership's interest must be real, substantial and continuing. Such interest is characterized by:

(a) Risk of loss/share of profit commensurate with the proportional ownership; and

(b) Receipt of the customary incidents of ownership, such as compensation (i.e., salary and other personnel compensation)

(iii) A minority owner must have and exercise control of the business decisions. Characteristics of control include, but are not limited to:

(a) Authority to sign bids and contracts;

(b) Decisions in price negotiations;

(c) Incurring liabilities for the firm;

(d) Final staffing decisions;

(e) Policy-making; and

(f) General company management decisions.

(iv) Only those firms performing a useful business function according to custom and practice in the industry are qualified as MBEs. Acting merely as a passive conduit of funds to some other firm where such activity is unnecessary to accomplish the project does not constitute a "useful business function according to custom and practice in the industry." The purpose of this approach is to discourage the use of MBE "fronts" and limit the creation of an artificial supplier and broker marketplace.

(2) Women's Business Enterprise (WBE) is a business which is certified as such by a State or Federal agency, or which meets the following definition:

"A women's business enterprise is an independent business concern which is at least 51 percent owned by a woman or women, who also control and operate it. Determination of whether a business is at least 51 percent owned by a woman or otherwise qualified WBE which is 51 percent owned by a married woman in a community property State will not be disqualified because her husband has a 50 percent interest in her share. Similarly, a business which is 51 percent owned by a married man and 49 percent owned by an unmarried woman will not become a qualified WBE by virtue of his wife's 50 percent interest in his share of the business."

As in the case of a MBE, only United States citizens will be deemed to be WBEs. Similar to the MBE criteria, WBE should meet the criteria cited in subparagraphs B.1.c.(2), (3), and (4).

(3) Fair Share or Fair Share Objective A fair share or a fair share objective is an amount of funds reasonably commensurate with the total project funding and the availability of qualified DBEs, taking into account experience on EPA-funded projects and other comparable projects in the area. A fair share objective does not constitute an absolute requirement, but a commitment on the part of the bidder to exercise good faith efforts as defined in this section to use DBEs to achieve the fair share objective.

(4) Small Business (SBE). Any business entity, including its affiliates, that is independently owned and operated, and not dominant in its field of operations in which it is bidding on Government contracts, and qualified as a small business under the criteria and size standards set forth in 13 CFR Part 121.

(5) Small Business in a Rural Area. A small business in a rural area (SBRA) is a business entity meeting the definition of a small business, and is located and conducts its principal operations in a geographical area (county) listed in the Small Business Administration's Listing of Non-Metropolitan Counties by State.

(6) Recipient. A party receiving SRF financial assistance.

- (7) Project. The scope of work from which an SRF loan is awarded.
- (8) Bidder. A party seeking to obtain a contract with a recipient through a competitive, advertised, sealed bid process.
- (9) Offeror. A party seeking to obtain a contract with a recipient through a negotiative procurement process.
- (10) Prime Contractor. A party that has obtained a contract with a recipient through a competitive, advertised, sealed bid process.
- (11) Good Faith Efforts. Good faith efforts by a recipient, prime contractor, and/or bidder/offeror means efforts to attract and utilize SBEs, and DBEs, primarily through outreach, recruitment, and race/gender neutral activities. The following are examples of activities to assist recipients, prime contractors and/or bidders/offerors to comply with good faith efforts.

a. Include qualified SBEs, and DBEs, on solicitation lists.

- (i) Maintain and update a listing of qualified SBEs, and DBEs, and SBRAs that can be solicited for supplies, construction and/or services.
- (ii) Provide listings to all interested parties who requested copies of the bidding or proposing documents.
- (iii) Contact appropriate sources within your geographic area and State to identify qualified DBEs for placement on your minority and women's business listings.
- (iv) Utilize other DBE listings such as those of the State's Minority Business Office, the Small Business Administration, Minority Business Development Agency, US EPA- Office of Small and Disadvantaged Business Utilization (OSDBU) and the Department of Transportation.
- (v) Have the State environmental agency personnel review this solicitation list.

b. Assure that SBEs, and DBEs, are solicited.

- (i) Conduct meetings, conferences, and follow-ups with SBEs, DBEs, and SBRAs, small, minority and/or women's business associations, minority media, etc., to inform these groups of opportunities to provide supplies, services, and construction.

(ii) DBE Utilization is facilitated if the recipient or prime contractor advertise through the minority media. Such advertisements may include, but are not limited to, contracting and subcontracting opportunities, hiring and employment, or any other matter related to the project.

(iii) Conduct pre-bid, pre-solicitation, and post-award conferences to ensure that consultants, suppliers, and builders solicit SBEs, DBEs, and SBRAs.

(iv) Provide bidders and offerors with listings of qualified SBEs, DBEs, and SBRAs and establish that a fair share of contracts/procurements should be awarded to these groups.

(v) Advertise in general circulation, trade publications, State agency publications of identified source, minority or women's business focused media, etc., concerning contracting opportunities on your projects. Maintain a list of minority or women's business-focused publications that may be utilized to solicit DBEs.

(vi) Provide interested SBEs, DBEs, or SBRAs with adequate information about plans, specifications, timing and other requirements of the proposed projects.

(vii) Provide SBE, SBRA, DBE trade organizations with succinct summaries of solicitations.

(viii) Notify SBEs, DBEs or SBRAs of future procurement opportunities so that they may establish bidding solicitations and procurement plans.

c. Divide total requirements when economically feasible, into small tasks or quantities to permit maximum participation of SBEs, DBEs and SBRAs.

(i) Perform an analysis to identify portions of work that can be divided and performed by qualified SBEs, DBEs and SBRAs.

(ii) Scrutinize the elements of the total project to develop economically feasible units of work that are within the bonding range of SBEs, DBEs and SBRAs.

(iii) Analyze bid packages for compliance with the good faith efforts to afford SBEs, DBEs and SBRAs maximum participation.

d. Establish delivery schedules, where requirements of the work permit, which will encourage participation by SBEs, DBEs and SBRA.

(i) Consider lead times and scheduling requirements often needed by SBE, DBE or SBRA participation.

(ii) Develop realistic delivery schedules which may provide for greater SBE, DBE or SBRA participation.

e. Use the services and assistance of the Small Business Administration and the Minority Business Development Agency of the US Department of Commerce, as appropriate.

(i) Use the services of outreach programs sponsored by the Minority Business Development Agency and/or the Small Business Administration to recruit bona fide firms for placement on SBEs', DBEs, or SBRA's bidders lists to assist these firms in the development of bid packaging.

(ii) Seek out Minority Business Development Centers (MBDCs) to assist recipients and prime contractors in identifying DBEs for potential work opportunities on this project

3. REPORTING FORMS

A. GOOD FAITH EFFORT DOCUMENTATION

(1) Bidders/offerors shall demonstrate compliance with good faith efforts in order to be deemed responsible. Demonstration of compliance may include completing Form A. However, the recipient may specify other methods of demonstrating compliance.

B. QUARTERLY REPORTING

(1) The recipient must submit "DBE Utilization Under Federal Grants, Cooperative Agreements, and Interagency Agreements," to the Project Administrator beginning with the Federal Fiscal year quarter the bid is awarded and continuing until the project is completed. These reports must be submitted within 5 days of the end of the Federal fiscal quarter or by January 5, April 5, July 5, and October 5. Please mail or fax reports to:

Colorado Department of Public Health and Environment
WQCD-OA-B2
ATTN: Matthew Stearns
4300 Cherry Creek Drive South
Denver, CO 80246

Or fax to Matthew Stearns at (303) 782-0390

The following additional reinstated forms approved by OMB ICR 2047.04 must be included in the bid package. Under 40 CFR 33.302 (f) the Prime Contractor is responsible for the following forms:

EPA Form 6100–2 *DBE Subcontractor Participation Form*

The Prime Contractor will provide this form, along with the instruction page, to all of its DBE subcontractors.

EPA Form 6100-2 gives the DBE subcontractor the chance to describe the work the DBE subcontractor received from the Prime Contractor, how much the DBE subcontractor was paid and any other concerns the DBE subcontractor might have (for example reasons why the DBE subcontractor believes it was terminated by the Prime Contractor).

DBE subcontractors may send completed copies of EPA Form 6100–2 directly to the EPA Region 8 DBE Coordinator:

Marshall Pullman, Regional Program Coordinator
US EPA, Region 8
8OC-EISC
1595 Wynkoop St
Denver, CO 80202-1129

Phone: 303-312-6499 & email: pullman.marshall@epa.gov

EPA Form 6100–3 *DBE Subcontractor Performance Form*

The Prime Contractor will provide this form, along with the instruction page, to all of its DBE subcontractors.

EPA Form 6100-3 gives the DBE subcontractor the chance to report the scope and cost of the subcontract it received, providing a check for the information that the Prime Contractor put in EPA Form 6100-4.

The proposed DBE subcontractor shall forward a completed copy of the form to the Prime Contractor along with the subcontractor's quote. The Prime Contractor will include all completed 6100-3 forms as part of the Prime Contractor's bid or proposal package.

EPA Form 6100-4 Subcontractor *Utilization Form*

This form captures the Prime Contractor's intended use of an identified DBE Subcontractor, and the estimated dollar amount of the subcontract. Each Prime Contractor shall complete this form.

1. List each subcontract discipline you will consider subcontracting – regardless of whether a subcontractor is already chosen. If you will not subcontract, mark form "N/A."
2. The Prime Contractor shall provide this form to the loan recipient within 10 days of bid opening.
3. The loan recipient shall provide this form, completed by the Prime Contractor, to the State Revolving Loan Fund Program within 14 days of bid opening
4. Use additional sheets as necessary.
5. The "**US citizen?**" question is required because, under 40 CFR 33.202, USEPA tracks DBE participation only for firms owned by citizens of the United States of America. Show whether the referenced DBE firm's owner is a citizen of the United States.

Additional reporting is required throughout the project. Within 30 days of contract award, the contractor must provide a copy of each DBE businesses' certification as well as their contract amount (See Form B). These quarterly reports corresponding to the federal fiscal year (October-December, January-March, April-June, July-September) must be filled out and submitted to the appropriate Project Administrator in the Water Quality Control Division.

Form	Requirement	Provided By	Completed By	Submitted To
EPA Form 6100-2	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	EPA DBE Coordinator
EPA Form 6100-3	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	Recipients as part of bid or proposal package
EPA Form 6100-4	Recipients required to have prime contractors complete the form	Recipients	Prime Contractors	Recipients as part of bid or proposal package

FORM A – DBE SUBCONTRACTOR SOLICITATION INFORMATION					
PROJECT NAME:					
Subcontractor Name and Telephone Number	MBE or WBE	Description of Work Offered	Date of Phone Follow-up & Person Contacted	Amount of Bid or Reason for not Quoting	Bid Accepted or Rejected? Include Reason for Rejection

This information is true and correct to the best of my knowledge.

 Contractor Name, Address & Phone Number

 Signature Title Date

Fax to Appropriate Project Administrator at (303) 782-0390

FORM B - DBE PROCUREMENTS MADE DURING QUARTER**Federal Quarter:**_____1st (Oct-Dec); 2nd (Jan-Mar);3rd (Apr-Jun); 4th (Jul-Sep)

Procurement Made By		Business Enterprise		Dollar Value of Procurement	Date of Award MM/DD/YY	Type of Product or Service 3 = Construction 9 = Engineering	Name/Address of DBE Contractor or Vendor	
Loan Recipient	Other	MBE	WBE					
				\$				
				\$				
				\$				
				\$				
<u>Loan Recipient:</u>				<u>SRF Loan Number:</u>			<u>Amount Paid this Quarter</u>	<u>Cumulative Amount Paid to Date</u>
<u>Loan Reporting Contact:</u>		<u>Phone:</u>		<u>SRF Loan Amount:</u> \$		<u>MBEs:</u>	\$	\$
<u>State SRF Contact:</u> Matthew Stearns		<u>Phone:</u> (303) 691-4064		Fax: (303) 782-0390		<u>WBEs:</u>	\$	\$
<u>Name of Authorized Representative (Loan Recipient):</u>				<u>Title:</u>		<u>Signature of Authorized Representative (Loan Recipient):</u>		<u>Date:</u>
<u>Name of Prime Contractor:</u>				<u>Telephone Number:</u>		<u>Signature of Contractor Project Manager:</u>		<u>Date:</u>

****Form due within 5 days after the end of each quarter throughout construction.****

Last Revised: 01/28/2014

Disadvantaged Business Enterprise (DBE) Program DBE Subcontractor Participation Form

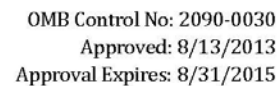
An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE¹ subcontractor² the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services , Equipment or Supplies	Amount Received by Prime Contractor

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.



Please use the space below to report any concerns regarding the above EPA-funded project:

This image shows a blank sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Subcontractor Signature	Print Name
Title	Date

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form**

This form is intended to capture the DBE¹ subcontractor's² description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies	Price of Work Submitted to the Prime Contractor
DBE Certified By: ___ DOT ___ SBA ___ Other: _____		Meets/ exceeds EPA certification standards? ___ YES ___ NO ___ Unknown

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	Date

Subcontractor Signature	Print Name
Title	Date

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form**

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE¹ subcontractors² and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Issuing/Funding Entity:			

I have identified potential DBE certified subcontractors	___ YES	___ NO	
If yes, please complete the table below. If no, please explain:			
Subcontractor Name/ Company Name	Company Address/ Phone/ Email	Est. Dollar Amt	Currently DBE Certified?
Continue on back if needed			

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.



OMB Control No: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	Date

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

4. EQUAL EMPLOYMENT OPPORTUNITY AND AFFIRMATIVE ACTION REQUIREMENTS ON FEDERALLY ASSISTED CONSTRUCTION CONTRACTS

A. NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

This notice shall be included in, and shall be a part of, all solicitations for offers and bids on all federal and federally assisted construction contracts or subcontracts.

(1) The Offerer's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.

(2) The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Minority Participation In Each Trade	Female Participation In Each Trade
(County)	7.0%

These goals are applicable to all the contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

(3) The contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number for the

subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed (See Form C).

(4) As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is _____.

B. EQUAL

(1) The Equal Opportunity Clause published at 41 CFR Part 60-1.4(b) is required to be included in, and is part of, all nonexempt federally assisted construction contracts and subcontracts. By operation of the order, the equal opportunity clause shall be considered to be a part of every contract and subcontract required by the order and the regulations in this part to include such a clause whether or not it is physically incorporated.

(2) In addition to the clauses described above, all federal contracting officers, all applicants, and all non-construction contractors, as applicable, shall include the specifications set forth in this section in all federal and federally assisted construction contracts in excess of \$10,000 to be performed in geographical areas designated by the Director pursuant to 41 CFR 60-4.6 of this part and in construction subcontracts in excess of \$10,000 necessary in whole or in part to the performance of nonconstruction Federal contracts and subcontracts covered under the Executive Order.

5. STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

A. DEFINITIONS AS USED IN SPECIFICATIONS

- (1) "Covered Area" means the geographical area described in solicitation from which this contract resulted;
- (2) "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
- (3) "Employer identification number" means the Federal Social Security number used on the employer's quarterly Federal Tax Return, U.S. Treasury Department Form 941.
- (4) "Minority" includes:
 - (a) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (b) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - (c) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asian, the Indian Subcontinent, or the Pacific Islands);
 - (d) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North American and maintaining identifiable tribal affiliations through membership and participation or community identification).

B. DETAILED SPECIFICATIONS

- (1) Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$25,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
- (2) If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area, (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

(3) The contractor shall implement the specific affirmative action standards provided in paragraphs (6)(a) through (p) of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.

(4) Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

(5) In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the contractor during the training period, and the contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

(6) The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

- a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

- b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations where the contractor or its unions have employment opportunities available, and maintain a record of the organization's responses.

- c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the contractor may have taken.

- d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor

has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the areas which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under (7)(b) above.

f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.
- i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations servicing the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.
- k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- m. Ensure that seniority practices, job classification, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations are followed.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.

(7) Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (6)(a) through (p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under (6)(a) through (p) of the specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.

(8) A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally, the contractor may be in violation of the order if a specific minority group of women is under-utilized).

(9) The contractor shall not use the goals and timetables of affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

(10) The contractor shall not enter into any subcontract with any person or firm debarred from government contracts pursuant to Executive Order 11246.

(11) The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

(12) The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph (6) of these specifications, so as to achieve maximum results from its efforts to ensure equal

employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.3.

(13) The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

(14) Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

6. REPORTING FORM

The contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number for the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed (See Form C).

FORM C

CONTRACTOR ' S NAME, ADDRESS & TELEPHONE NUMBER

CONTRACTOR' EMPLOYER ID NUMBER:

Return to:

USDOL/ESA/OFCCP
Denver District Office
1999 Broadway, Ste. 1177
PO Box 46550
Denver CO, 80201-3650
(720) 264-3200

CONTRACT INFORMATION

PROJECT AND LOCATION:				
Dollar Amount of Contract	Estimated Start Date	Estimated Completion Date	Contract No.	Geographical Area

NOTIFICATION OF SUBCONTRACTS AWARDED (>\$10,000)

Subcontractor ' s Name, Address, & Phone Number	Employer ID Number of Subcontractor	Estimated \$ Amount of Subcontract	Estimated Start Date	Estimated Completion Date

Last Revised: 01/28/2014

Section V – Buy American Requirement

1. BUY AMERICAN

On January 17, 2014, H.R. 3547, “Consolidated Appropriations Act, 2014” was enacted requiring compliance with Buy American provisions by all contracts and subcontracts for the construction of treatment works carried out in whole or in part with assistance made available through the State Water Pollution Control Revolving Fund (WPCRF) or Drinking Water Revolving Fund (DWRP). All of the iron and steel products used in the project must be produced in the United States.

Iron and steel products means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers, and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete and construction materials.

Application of the Buy American requirement is as follows:

- Projects that do not have an executed loan agreement prior to 1/17/2014 are subject to this requirement.
- Projects that do not have plans and specifications approval prior to 1/17/2014 are subject to this requirement.
- Projects that have an executed loan agreement prior to 1/17/2014 are not subject to this requirement.
- Projects that have plans and specifications approval prior to 1/17/2014 are not subject to this requirement.

The Buy American Requirement guidance memorandum dated 01/24/2014 can be found on the Grants and Loans website: www.colorado.gov/cdphe/wqcd/grantsandloans

Note: If your project is not subject to the Buy American Requirement you may remove this section from your plans and specifications. If you are uncertain whether or not this requirement pertains to your project, please contact your project manager before going to bid.

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Work covered by Contract Documents
- B. Work by others
- C. Contractor use of site and premises
- D. Work sequence
- E. Easements and right-of-way
- F. Protection of public and private property
- G. Protection of Work and facilities
- H. Maintenance of traffic
- I. Barricades and lights
- J. Lines, grades, and survey
- K. Cutting and patching
- L. Regulatory requirements

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The work will include all necessary labor, supervision, equipment, tools, and materials to install a duplex submersible grinder pump station in an existing wet well and a high density polyethylene force main. Work includes, but is not limited to, lift station equipment and controls, site electrical modifications, existing wastewater pond cleaning and biosolids removal, force main, horizontal directional drilling, associated valves and cleanouts, tie-in to existing manhole, and site grading and reseeded.
- B. Furnish and pay for all materials, equipment, supplies, appurtenances; provide all construction equipment and tools; and perform all necessary labor and supervision
- C. Coordinate the progress of the Work including coordination between trades, subcontractors, suppliers, public utilities and subsequent building contractor performing work on site and Owner to insure the progress of Work

- D. It is the intent of this contract that Work proceed in the most expeditious manner possible with scheduled milestones
- E. Construct the Work under contract indicated in the Bid Form

1.3 WORK BY OTHERS

- A. Xcel Energy will be constructing an electric service line from County Road 17 and onsite near the lift station.

1.4 CONTRACTOR USE OF SITE AND PREMISES

- A. Contractor shall limit use of the premises for Work and will use the designated staging area for field offices, equipment, and material storage. Areas have been designated for contractor's use.
- B. Coordinate use of premises under direction of Engineer and/or Owner
- C. Assume full responsibility for the protection and safekeeping of equipment and products stored on site under this Contract
- D. Contractor may use only those areas indicated on the Drawings for storage and such additional areas as Engineer may designate
- E. Contractor should plan for normal work days, Monday through Friday, within the hours of 7:00 am to 7:00 pm. Other work hours and days may be allowed by Larimer County, Owner, and Engineer upon 48 hours written notice.
- F. Provide open access for Owner to property at all times during construction. Maintain minimum width clearance for access of Larimer County and Contractor personnel and emergency vehicles at all times
- G. Owner shall coordinate with Contractor the entrance into work site for work performed under the Contract Documents to ensure Contractor's health and safety plans are followed
- H. Owner shall allow access by operator to perform routine operations, maintenance, sampling, and inspections

1.5 WORK SEQUENCE

- A. Construct Work to allow for work by others. Coordinate construction schedule with the Owner and Engineer
- B. Existing wastewater treatment facility is an operating treatment plant and must remain in operation until the force main and lift service are in operation.
- C. Contractor to submit intended sequence of construction with schedule for all Work that requires bypass pumping

- D. Sequences other than those specified will be considered by Engineer, provided they afford equivalent continuity of operations
- E. Temporary bypass pumping shall be provided by the Contractor to complete all necessary Work and at a minimum during the following activities:
 - 1. Work in the existing lift station wet well
 - a. Bypass pumping provided from metering manhole to existing WWTF lagoons
 - 2. Replacement of the existing valve vault
 - a. Bypass pumping provided from existing lift station wet well to existing WWTF lagoons
 - 3. Connection to the Dry Creek Interceptor manhole
 - a. Bypass pumping provided from the upstream manhole to the downstream manhole
- F. The following Work shall not begin until the new lift station and force main are in service
 - 1. Removal of Parshall Flume and equipment in upstream manhole
 - a. Provide bypass pumping from final manhole of collection system to lift station wet well
 - 2. Extension of the Riverside Farm HOA force main, is not to occur until the lift station and force main are completed.
 - a. This connection is to occur during a 24 hour shut down of the Riverside Farm HOA lift station
 - 3. Removal of the existing WWTF equipment
 - 4. Cleaning and site regrading of the WWTF lagoons
- G. Power outages of up to 2 hours duration, and sewer service interruptions of up to 4 hours duration will be permitted
 - 1. Electrical work in the lift station building is to be scheduled to minimize the frequency and duration of electrical shutdowns.
 - 2. Schedule any and every outage with Engineer and Owner
 - a. Number of all outages to be kept to a minimum

1.6 EASEMENTS AND RIGHT-OF-WAY

- A. Work shall be performed within the dedicated right-of-way, utility easement, and on Owner property.
- B. Areas not designated for access roads, parking areas, storage areas, existing facilities areas, and construction areas, Contractor shall not trespass in or on these areas
 - 1. Contractor shall be responsible for keeping all their personnel out of areas not designated for Contractor use except in case of isolated Work located within these areas for which the Contractor shall coordinate with Owner and shall not proceed with such work without Owner approval
- C. Contractor shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies, so as to prevent damage of Larimer County property.

1. Responsibility for protection and safekeeping of materials and equipment on or near the work site shall be entirely that of the Contractor and no claim shall be made against the Owner for any reason
2. If the Owner needs access to the sites occupied by stored materials or equipment, Contractor shall provide access

D. On Private Property

1. Do not enter for material delivery or occupy for any purpose with personnel, tools, equipment, construction materials, or excavated materials, any private property outside the designated construction easement without written permission of the owner and tenant

E. Within Street Right-of-Way and Utility Easement

1. Perform all work and conduct all operations of Contractor, his employees, and his subcontractors in accordance with the requirements of Larimer County

1.7 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

- A. Protect, shore, brace, support, and maintain underground conduits, drains, and other underground construction uncovered or otherwise affected by construction operations
- B. Contractor shall be responsible for all damage to streets, roads, highways, shoulders, street lighting and/or signage, embankments, culverts, location or character, which may be caused by transporting equipment, materials, or personnel to or from the Work or any part or site thereof, whether by him or his subcontractors
- C. Make satisfactory and acceptable arrangements with the Owner of, or the agency or authority having jurisdiction over, any damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage

1.8 PROTECTION OF WORK AND FACILITIES

- A. Contractor shall be solely responsible for the protection of Work until final acceptance
- B. Contractor shall protect all and any previously performed Work, work in progress or completed by others, and existing facilities from damage during the performance of Work in the area

1.9 MAINTENANCE OF TRAFFIC

- A. Conduct Work to interfere as little as possible with Larimer County, Town of Berthoud and public travel, whether vehicular or pedestrian
 1. Whenever it is necessary to cross, close, or obstruct private roads, driveways and walks, provide and maintain suitable and safe detours, or other temporary expedients for accommodation of private travel
 - a. Submit right-of-way permit application and traffic control plans of County Road 17 work for approval by Larimer County

1.10 BARRICADES AND LIGHTS

- A. Protect streets, roads, highways, and other public thoroughfares which are closed to traffic by effective barricades with acceptable warning and directional signs
- B. Locate barricades at the street intersecting public thoroughfare on each side of the blocked section
- C. Provide suitable barriers, signs, and lights to the extent required to adequately protect the public
- D. Provide similar warning signs and lights at obstructions such as material piles and equipment
- E. Illuminate barricades and obstructions with warning lights from sunset to sunrise
- F. Store materials and conduct work to cause the minimum obstruction to the other contracts
- G. Install and maintain barricades, signs, lights, and other protective devices in conformity with applicable statutory requirements including the Manual of Uniform Traffic Control Devices and as required by Larimer County

1.11 LINES, GRADES AND SURVEY

- A. Construct all Work to the lines, grades, and elevations indicated on the drawings
 - 1. Contractor is responsible for correcting all incorrect grades or grades not meeting specified tolerances
- B. Engineer has established basic horizontal control points in the plans
 - 1. Use these points as datum for the Work
 - 2. Provide such competent personnel and tool, stakes, and other materials as Engineer may require in establishing or designating control points, in establishing construction easement boundaries, or in checking layout survey, and measurement work performed by Contractor
- C. Provide all additional survey, layout, and measurement work required
 - 1. Work performed by a qualified professional engineer or registered land surveyor acceptable to Engineer
 - 2. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction
 - a. Make no changes or relocations without prior written notice to Engineer
 - b. Report to Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations
 - c. Require a qualified professional engineer or registered land surveyor acceptable to Engineer to replace Project control points which may be lost or destroyed.
 - d. Establish replacements based on original survey control
 - 3. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means
 - a. Temporary project benchmark

- b. Stakes for grading, fill and topsoil placement
 - c. Utility slopes and invert elevations
- 4. From time to time, verify layouts by the same methods
- 5. Maintain a complete, accurate log of all control and survey work as it progresses
- 6. On request of Engineer, submit documentation to verify accuracy of field engineering work

1.12 CUTTING AND PATCHING

- A. Contractor shall be responsible for all cutting, and patching, including attendant excavation and backfill, required to complete the Work or to
 - 1. Uncover portions of the Work to provide for installation of ill-timed work
 - 2. Remove and replace defective work
 - 3. Remove and replace work not conforming to requirements of Contract Documents
 - 4. Remove samples of installed work as specified for testing
- B. Provide products as specified or as required to complete cutting and patching operations
- C. Inspection
 - 1. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching
 - 2. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work
 - 3. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with the work until the Engineer has provided further instructions
- D. Preparation
 - 1. Provide devices and methods to protect other portions of the Project from damage
 - 2. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water
 - 3. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes
 - 4. Restore work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents

1.13 REGULATORY REQUIREMENTS

- A. Comply with all federal, state, and local laws, regulations, codes, and ordinances applicable to the Work
- B. References in the Contract Document to local codes shall mean the codes in effect in Larimer County according to the jurisdiction in which the Work is performed.
- C. Other standards and codes which apply to the Work are designated in the specific technical specifications

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01020

GEOTECHNICAL REPORT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Reports of explorations and tests of subsurface conditions at the project site.

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01020-A – Supplement: Geotechnical Report
- C. Section 02300 – Earthwork

1.3 INVESTIGATION

- A. Soil and subsurface investigations were conducted at the lift station site and along the force main alignment, the results of which are to be found on the Plans and in the report issued by Ground Engineering Consultants, Subsurface Exploration Program: Geotechnical Recommendations; River Glen Waste Water Treatment Facility Improvements, Larimer County, Colorado, dated July 31, 2013.
- B. A reference copy of the report is included herein, as Supplement A (01020)
- C. Bidders are expected to examine soils investigation data and to make their own investigation of the site prior to the bid date.

1.4 INTERPRETATION

- A. Soil investigation data is provided only for information and the convenience of bidders. Owner and Engineer disclaim any responsibility for the accuracy, true location, and extent of the soils investigation that has been prepared by others. They further disclaim responsibility for interpretations of that data by bidders, as in projecting soil-bearing values, rock profiles, soil stability and the presence, and level and extent of underground water.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

**Subsurface Exploration Program
Geotechnical Recommendations
River Glen Waste Water Treatment Facility
Improvements
Larimer County, Colorado**

Prepared For:

**JVA, Inc.
1319 Spruce Street
Boulder, Colorado 80302**

Attn: Mr. William Raatz

Job Number: 13-0022

July 31, 2013

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PURPOSE AND SCOPE OF STUDY

This report presents the results of a subsurface exploration program performed by GROUND Engineering Consultants, Inc. (GROUND) to provide geotechnical recommendations for the proposed improvements to the River Glen Wastewater Treatment Facility located north of the intersection of County Road 17 and Wagon Wheel Court in Larimer County, Colorado. Our study was conducted in general accordance with GROUND's Proposal No. 1305-0809, dated May 2nd, 2013.

Field and office studies provided information obtained at the test hole locations regarding surface and subsurface conditions, including the existing site vicinity improvements. Material samples retrieved during the subsurface exploration were tested in our laboratory to assess the engineering characteristics of the site earth materials, and assist in the development of our geotechnical recommendations. Results of the field, office, and laboratory studies are presented below.

This report has been prepared to summarize the data obtained and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of engineering considerations related to construction of the proposed improvements are included herein.

PROPOSED CONSTRUCTION

We understand that proposed construction will consist of a new wet well and a new force main. The proposed force main will extend north on County Road 17 from the lift station to an existing manhole associated with the Town of Berthoud wastewater system. No site grading plans were available at the time of this report preparation. We anticipate only minor cuts and fills on the order of 1 foot will be required to facilitate proposed construction. We also assume that structural loads associated with the new wet well will be light. If proposed construction, including the anticipated site grading or loading conditions, differ from those described above, or changes subsequently, GROUND should be notified to re-evaluate our recommendations in this report.

SITE CONDITIONS

At the time of our exploration, the project site existed as an active waste water treatment facility with three lagoons. The general topography across the waste water treatment site was gently sloping to the northeast with slopes up to approximately 5 percent. The right-of-way of County Road 17 is gently rolling along the proposed force main alignment. The waste water treatment facility project site is bordered by residential housing to the south, an open field to the west, the little Thompson River to the north, and County Road 17 to the East. The proposed force main will extend north on County Road 17 from the lift station to an existing manhole associated with the Town of Berthoud wastewater system.

Fill was encountered locally in test holes TH-1 and TH-2 at the time of drilling. The exact extents, limits, and composition of any fill were not determined as part of the scope of work addressed by this study, and should be expected to exist at varying depths and locations across the site.

SUBSURFACE EXPLORATION

The subsurface exploration for the project was conducted on July 5th, 2013. A total of nine (9) test holes were drilled with a truck-mounted, continuous flight power auger rig to evaluate the subsurface conditions as well as to retrieve soil and bedrock samples for laboratory testing and analysis. Of these, three (3) test holes were drilled within the area of the existing wastewater treatment facility and six (6) test holes were drilled within the alignment of the proposed force main on CR 17. The test holes were drilled to depths ranging from approximately 10 to 20 feet below existing grades. A representative of GROUND directed the subsurface exploration, logged the test holes in the field, and prepared the soil and bedrock samples for transport to our laboratory.

Samples of the subsurface materials were retrieved with a 2-inch I.D. California liner sampler. The sampler was driven into the substrata with blows from a 140-pound hammer falling 30 inches. This procedure is similar to the Standard Penetration Test described by ASTM Method D1586. Penetration resistance values, when properly evaluated, indicate the relative density or consistency of soils. Depths at which the samples were obtained and associated penetration resistance values are shown on the test hole logs.

The approximate locations of the test holes are shown in Figures 1a and 1b. Logs of the exploratory test holes are presented in Figures 2 and 3. Explanatory notes and a legend are provided in Figure 4.

LABORATORY TESTING

Samples retrieved from our test holes were examined and visually classified in the laboratory by the project engineer. Laboratory testing of soil samples obtained from the subject site included standard property tests, such as natural moisture contents, dry unit weights, grain size analyses, and liquid and plastic limits. A water-soluble sulfate test was completed on a selected sample of the soils as well. Laboratory tests were performed in general accordance with applicable ASTM and AASHTO protocols. Results of the laboratory testing program are summarized on Tables 1 and 2.

SUBSURFACE CONDITIONS

The subsurface conditions encountered in the test holes were variable but generally consisted of a thin veneer of topsoil/asphalt/roadbase respectively, ranging in thickness from 3 to 6 inches. The surface materials were generally underlain by sand and clay to depths ranging from approximately 8 to 18 feet below existing grades. Clayey sand was encountered below the clay and sand at depths ranging from approximately 8 to 14 feet below existing grades and extended to the test hole termination depths.

Fill was encountered locally in test holes TH-1 and TH-2 to a depth of approximately 3 to 4 feet below existing grades. Claystone was encountered locally in test hole TH-9 from approximately 1 foot below existing grade to the test hole termination depth of approximately 10 feet below existing grade.

Based on Test Hole TH-7, TH-9 and P-1 the existing pavement of Larimer County Road 17 consists of approximately 5 inches of asphalt over approximately 6 inches of Road Base materials.

Fill materials consisted of sandy clay materials and were fine to medium grained, low to medium plastic, dry to slightly moist, and brown in color.

Sand and Clay materials ranged from sandy clay to clayey sand were occasionally silty, fine to medium grained with local gravel lenses, low to medium plastic,

loose/medium to dens/very stiff, moist to wet, and light brown to dark brown in color with occasional calcite.

Sand was clayey to silty, fine to coarse grained with occasional gravel, low plasticity to non-plastic, loose to medium dense, moist to wet, and brown to tan in color.

Sand and Gravel was clayey, fine to coarse grained with gravel, non to low plasticity, medium dense, wet, and brown in color.

Claystone Bedrock had local sandstone lenses, was fine grained, medium to highly plastic, hard to very hard, dry to slightly moist, and gray-blue in color with occasional iron staining.

Groundwater was encountered locally in test holes TH-2 to TH-4 at depths ranging from approximately 13 to 16 feet below existing grade at the time of drilling and when measured 14 days after drilling. Groundwater levels can be expected to fluctuate, however, in response to annual and longer-term cycles of precipitation, irrigation, surface drainage, nearby rivers and creeks, land use, and the development of transient, perched water conditions. The soils classification and properties of the native materials at the bearing depth for the wet well (approximately 15 feet below existing grade) are not characteristic of swelling materials.

FOUNDATION SYSTEM (Wet Well Structure)

The design and construction criteria presented below should be observed for a spread footing foundation system. The construction details should be considered when preparing project documents. The precautions and recommendations provided below will not prevent movement of the foundations; however, the recommended measures will tend to make the movement more uniform, and reduce resultant damage if such movement occurs. Based on the assumption of effective surface and subsurface drainage away from the building as well as the recommendations presented herein, we anticipate the following system would result in total movement potentials on the order of 1 inch. Movement estimates are difficult to predict and actual movements may be more or less.

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- 1) Foundations should be overexcavated at least 18 inches and replaced with 1-½ inch minus stabilization material consisting of crushed rock or recycled concrete. The stabilization rock should be consolidated in 6 inch lifts with a large vibratory plate compactor. This should be visually verified and documented during placement.
- 2) Foundations bearing on properly placed stabilization rock may be designed for an allowable soil bearing pressure (Q) of 2,000 psf.

Based on this allowable bearing pressure, we anticipate post-construction settlements to be on the order of 1 inch. For other estimated settlements, allowable bearing pressure values can be obtained from Figure 5.

- 3) Based on the likely depths of excavation and groundwater, a properly designed and installed de-watering system will likely be required during the foundation construction. The risk of slope instability will be significantly increased in areas of seepage along the excavation slopes. If seepage is encountered, the slopes should be re-evaluated by the Geotechnical Engineer
- 4) A Geotechnical Engineer should be retained to observe the bottom of over excavation prior to placing stabilization rock.
- 5) Foundations should be provided with adequate soil cover above their bearing elevation for frost protection. Foundations should be placed at a bearing elevation 3 or more feet below the lowest adjacent exterior finish grades.
- 6) The lateral resistance of foundations will be developed as sliding resistance of the foundation bottoms on the foundation materials and by passive soil pressure against the sides of the foundation. Sliding friction at the bottom of foundation may be taken as 0.33 times the vertical dead load.
- 7) Compacted fill placed against the sides of the foundation should be compacted to at least 95 percent relative compaction in accordance with the recommendations in the *Project Earthwork* section of this report.

- 8) All foundation areas should be compacted with a vibratory plate compactor prior to placement of concrete. As stated, the foundation subgrade materials should be tested for compaction prior to concrete placement.

WATER-SOLUBLE SULFATES

The concentration of water-soluble sulfates measured in a selected sample obtained from a test hole measured to be 0.09 percent (Table 1). Such concentration of water-soluble sulfates represents a negligible degree of sulfate attack on concrete exposed to these materials. Degrees of attack are based on the scale of 'negligible,' 'moderate,' 'severe' and 'very severe' as described in the "Design and Control of Concrete Mixtures," published by the Portland Cement Association (PCA). The Colorado Department of Transportation (CDOT) utilizes a corresponding scale with 4 classes of severity of sulfate exposure (Class 0 to Class 3) as described in the published table below.

REQUIREMENTS TO PROTECT AGAINST DAMAGE TO CONCRETE BY SULFATE ATTACK FROM EXTERNAL SOURCES OF SULFATE

Severity of Sulfate Exposure	Water-Soluble Sulfate (SO₄) In Dry Soil (%)	Sulfate (SO₄) In Water (ppm)	Water Cementitious Ratio (maximum)	Cementitious Material Requirements
Class 0	0.00 to 0.10	0 to 150	0.45	Class 0
Class 1	0.11 to 0.20	151 to 1500	0.45	Class 1
Class 2	0.21 to 2.00	1501 to 10,000	0.45	Class 2
Class 3	2.01 or greater	10,001 or greater	0.40	Class 3

Based on these data GROUND, makes no recommendation for use of a special, sulfate-resistant cement in project concrete.

LATERAL EARTH PRESSURES

Structures which are laterally supported and can be expected to undergo only a limited amount of deflection should be designed for "at-rest" lateral earth pressures. The cantilevered retaining structures will be designed to deflect sufficiently to mobilize the full active earth pressure condition, and may be designed for "active" lateral earth pressures.

“Passive” earth pressures may be applied in front of the wall embedment to resist driving forces.

The at-rest, active, and passive earth pressures in terms of equivalent fluid unit weight for the on-site backfill and CDOT Class 1 structure backfill are summarized on the table below. Base friction may be combined with passive earth pressure if the foundation is in a drained condition. The use of passive pressure under a saturated condition is not recommended. The values for the on-site material provided in the table below were approximated utilizing a unit weight of 125 pcf and a phi angle of 26 degrees.

Lateral Earth Pressures (Equivalent Fluid Unit Weights)

Material Type	Water Condition	At-Rest (pcf)	Active (pcf)	Passive (pcf)
On-Site Backfill	Drained	70	49	320
On-Site Backfill	Submerged	98	87	222
Structure Backfill	Drained	55	35	400

To realize the lower equivalent fluid unit weight, the selected structure backfill should be placed behind the wall to a minimum distance equal to the retained wall height. Where structure backfill is used, the upper 1 foot of the wall backfill should be a relatively impermeable soil or otherwise protected to reduce surface water infiltration into the wall backfill.

The lateral earth pressures recommended above are for a horizontal upper backfill slope. The additional loading of an upward sloping backfill as well as loads from traffic, stockpiled materials, etc., should be included in the wall design. GROUND can provide the adjusted lateral earth pressures when the additional loading conditions and site grading are clearly defined.

PROJECT EARTHWORK

The following information is for private improvements; public roadways or utilities should be constructed in accordance with applicable municipal / agency standards.

General Considerations: Site grading should be performed as early as possible in the construction sequence to allow settlement of fills and surcharged ground to be realized to the greatest extent prior to subsequent construction.

Prior to earthwork construction, existing concrete, vegetation, and other deleterious materials should be removed and disposed of off-site. Relic underground utilities should be abandoned in accordance with applicable regulations, removed as necessary, and properly capped.

Existing Fill Soils: Man-made fill materials were encountered in select test holes during subsurface exploration. Actual contents and composition of the man-made fill materials are not known; therefore, some of the excavated man-made fill materials may not be suitable for replacement as backfill. The Geotechnical Engineer should be retained during site excavations to observe the excavated fill materials and provide recommendations for its suitability for reuse.

Use of Existing Native Soils: Overburden soils that are free of trash, organic material, construction debris, and other deleterious materials are suitable, in general, for placement as compacted fill. Organic materials should not be incorporated into project fills.

Fragments of rock, cobbles, and inert construction debris (e.g., concrete or asphalt) larger than 3 inches in maximum dimension will require special handling and/or placement to be incorporated into project fills. In general, such materials should be placed as deeply as possible in the project fills. A Geotechnical Engineer should be consulted regarding appropriate recommendations for usage of such materials on a case-by-case basis when such materials have been identified during earthwork. Standard recommendations that likely will be generally applicable can be found in Section 203 of the current CDOT Standard Specifications for Road and Bridge Construction.

Imported Fill Materials: If it is necessary to import material to the site, the imported soils should be free of organic material, and other deleterious materials. **Imported material should consist of soils that have less than 60 percent passing the No. 200 Sieve and should have a plasticity index of less than 15.** Representative samples of the materials proposed for import should be tested and approved by the Geotechnical Engineer prior to transport to the site.

Fill Platform Preparation: Prior to filling, the top 8 to 12 inches of in-place materials on which fill soils will be placed should be scarified, moisture conditioned and properly compacted in accordance with the recommendations below to provide a uniform base for fill placement. *If over-excavation is to be performed, then these recommendations for subgrade preparation are for the subgrade **below the bottom** of the specified over-excavation depth.*

If surfaces to receive fill expose loose, wet, soft or otherwise deleterious material, additional material should be excavated, or other measures taken to establish a firm platform for filling. The surfaces to receive fill must be effectively stable prior to placement of fill.

Fill Placement: Fill materials should be thoroughly mixed to achieve a uniform moisture content, placed in uniform lifts not exceeding 8 inches in loose thickness, and properly compacted.

Soils that classify as GP, GW, GM, GC, SP, SW, SM, or SC in accordance with the USCS classification system (granular materials) should be compacted to 95 or more percent of the maximum modified Proctor dry density at moisture contents within 2 percent of optimum moisture content as determined by ASTM D1557.

Soils that classify as ML, MH, CL or CH should be compacted to 95 percent of the maximum standard Proctor density at moisture contents from 1 percent below to 3 percent above the optimum moisture content as determined by ASTM D698.

No fill materials should be placed, worked, rolled while they are frozen, thawing, or during poor/inclement weather conditions.

Care should be taken with regard to achieving and maintaining proper moisture contents during placement and compaction. Materials that are not properly moisture conditioned may exhibit significant pumping, rutting, and deflection at moisture contents near optimum and above. The contractor should be prepared to handle soils of this type, including the use of chemical stabilization, if necessary.

Compaction areas should be kept separate, and no lift should be covered by another until relative compaction and moisture content within the recommended ranges are obtained.

Use of Squeegee: Relatively uniformly graded fine gravel or coarse sand, i.e., “squeegee,” or similar materials commonly are proposed for backfilling foundation excavations, utility trenches (excluding approved pipe bedding), and other areas where employing compaction equipment is difficult. In general, GROUND does not recommend this procedure for the following reasons:

Although commonly considered “self compacting,” uniformly graded granular materials require densification after placement, typically by vibration. The equipment to densify these materials is not available on many job-sites.

Even when properly densified, uniformly graded granular materials are permeable and allow water to reach and collect in the lower portions of the excavations backfilled with those materials. This leads to wetting of the underlying soils and resultant potential loss of bearing support as well as increased local heave or settlement.

GROUND recommends that wherever possible, excavations be backfilled with approved, on-site soils placed as properly compacted fill. Where this is not feasible, use of “Controlled Low Strength Material” (CLSM), i.e., a lean, sand-cement slurry (“flowable fill”) or a similar material for backfilling should be considered.

Where “squeegee” or similar materials are proposed for use by the contractor, the design team should be notified by means of a Request for Information (RFI), so that the proposed use can be considered on a case-by-case basis. Where “squeegee” meets the project requirements for pipe bedding material, however, it is acceptable for that use.

Settlements: Settlements will occur in filled ground, typically on the order of 1 to 2 percent of the fill depth. If fill placement is performed properly and is tightly controlled, in GROUND's experience the majority (on the order of 60 to 80 percent) of that settlement will typically take place during earthwork construction, provided the contractor achieves the compaction levels recommended herein. The remaining potential settlements likely will take several months or longer to be realized, and may be exacerbated if these fills are subjected to changes in moisture content. GROUND anticipates some degree of post-construction movement/distress as a result of settlement.

Cut and Filled Slopes: Permanent site slopes supported by on-site soils up to 10 feet in height may be constructed no steeper than 3:1 (horizontal : vertical). Minor raveling or surficial sloughing should be anticipated on slopes cut at this angle until vegetation is well re-established. Surface drainage should be designed to direct water away from slope faces.

EXCAVATION RECOMENDATIONS

The test holes for the subsurface exploration were excavated to the depths indicated by means of truck-mounted, flight auger drilling equipment. We anticipate no significant excavation difficulties in the majority of the site with conventional heavy-duty excavation equipment in good working condition.

We recommend temporary, un-shored excavation slopes up to 15 feet in height be cut no steeper than 1.5 (H) to 1 (V) in the on-site soils in the absence of seepage. Stockpiles should be placed back at least the same distance as the depth of the excavation from the top of the cut so as to not induce additional loading onto the slope. If site constraints require heavy equipment, stockpiles, or any other loading within this area the Geotechnical Engineer should be retained to evaluate those specific conditions. Dewatering operations should extend to the bottom of any cuts below the water table. Some surface sloughing may occur on the slope faces at these angles. Where seepage or flowing groundwater is encountered in project excavations, the Geotechnical Engineer should be retained to evaluate the conditions and provided additional recommendations, as appropriate. The risk of slope instability will be significantly increased in areas of seepage along excavation slopes.

Should site constraints prohibit the use of the recommended slope angles, temporary shoring should be used. The shoring should be designed to resist the lateral earth pressure exerted by structure, traffic, equipment, and stockpiles. GROUND can provide shoring design upon request.

Groundwater was encountered in several test holes at depths ranging from approximately 9 to 16 feet below existing grades the time of drilling and when measured 14 days after drilling. Therefore, groundwater may be encountered in the wet well excavation. A properly designed and installed de-watering system may be required during the wet well construction. The risk of slope instability will be significantly increased in areas of seepage along the excavation slopes. If seepage is encountered, the slopes should be re-evaluated by the Geotechnical Engineer.

Good surface drainage should be provided around temporary excavation slopes to direct surface runoff away from the slope faces. A properly designed swale should be provided at the top of the excavations. In no case should water be allowed to pond at the site. Slopes should be protected against erosion. Erosion along the slopes will result in sloughing and could lead to a slope failure. Any excavations in which personnel will be working must comply with all OSHA Standards and Regulations (CFR 29 Part 1926). The contractor's "responsible person" should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. GROUND has provided the information above solely as a service to the client, and is not assuming responsibility for construction site safety or the contractor's activities.

UTILITY PIPE INSTALLATION AND BACKFILLING

Pipe Support: The bearing capacity of the site soils appeared adequate, in general, for support of buried utilities. The utilities, typically, are less dense than the soils which will be displaced for installation. Therefore, GROUND anticipates no significant pipe settlements in these materials where properly bedded.

Excavation bottoms may expose soft, loose or otherwise deleterious materials, including debris. Firm materials may be disturbed by the excavation process. All such unsuitable materials should be excavated and replaced with properly compacted fill. Areas allowed to pond water will require excavation and replacement with properly compacted fill. The

contractor should take particular care to ensure adequate support near pipe joints which are less tolerant of extensional strains.

Where thrust blocks are needed, they may be designed for an allowable passive soil pressure of 320 psf per foot of embedment, to a maximum of 2,500 psf. Sliding friction at the bottom of thrust blocks may be taken as 0.33 times the vertical dead load.

Trench Backfilling: Some settlement of compacted soil trench backfill materials should be anticipated, even where all the backfill is placed and compacted correctly. Typical settlements are on the order of 1 to 2 percent of fill thickness. However, the need to compact to the lowest portion of the backfill must be balanced against the need to protect the pipe from damage from the compaction process. Some thickness of backfill may need to be placed at compaction levels lower than recommended or specified (or smaller compaction equipment used together with thinner lifts) to avoid damaging the pipe. Protecting the pipe in this manner can result in somewhat greater surface settlements. Therefore, although other alternatives may be available, the following options are presented for consideration:

Controlled Low Strength Material: Because of these limitations, we recommend backfilling the entire depth of the trench (both bedding and common backfill zones) with “controlled low strength material” (CLSM), i.e., a lean, sand-cement slurry, “flowable fill,” or similar material along all trench alignment reaches with low tolerances for surface settlements.

We recommend that CLSM used as pipe bedding and trench backfill exhibit a 28-day unconfined compressive strength between 50 to 200 psi so that re-excavation is not unusually difficult.

Placement of the CLSM in several lifts or other measures likely will be necessary to avoid ‘floating’ the pipe. Measures also should be taken to maintain pipe alignment during CLSM placement.

Compacted Soil Backfilling: Where compacted soil backfilling is employed, using the site soils or similar materials as backfill, the risk of backfill settlements entailed in the selection of this higher risk alternative must be anticipated and accepted by the Client/Owner.

We anticipate that the on-site soils excavated from trenches will be suitable, in general, for use as common trench backfill within the above-described limitations. Backfill soils should be free of vegetation, organic debris and other deleterious materials. Fragments of rock, cobbles, and inert construction debris (e.g., concrete or asphalt) coarser than 3 inches in maximum dimension should not be incorporated into trench backfills.

If it is necessary to import material for use as backfill, the imported soils should be free of vegetation, organic debris, and other deleterious materials. Imported material should consist of relatively impervious soils that have less than 60 percent passing the No. 200 Sieve and should have a plasticity index of less than 15. Representative samples of the materials proposed for import should be tested and approved prior to transport to the site.

Soils placed for compaction as trench backfill should be conditioned to a relatively uniform moisture content, placed and compacted in accordance with the recommendations in the *Project Earthwork* section of this report.

Pipe Bedding: Pipe bedding materials, placement and compaction should meet the specifications of the pipe manufacturer and applicable municipal standards. Bedding should be brought up uniformly on both sides of the pipe to reduce differential loadings.

As discussed above, we recommend the use of CLSM or similar material in lieu of granular bedding and compacted soil backfill where the tolerance for surface settlement is low. (Placement of CLSM as bedding to at least 12 inches above the pipe can protect the pipe and assist construction of a well-compacted conventional backfill, although possibly at an increased cost relative to the use of conventional bedding.)

If a granular bedding material is specified, GROUND recommends that with regard to potential migration of fines into the pipe bedding, design and installation follow ASTM D2321. If the granular bedding does not meet filter criteria for the enclosing soils, then non-woven filter fabric (e.g., Mirafi® 140N, or the equivalent) should be placed around the bedding to reduce migration of fines into the bedding which can result in severe, local surface settlements. Where this protection is not provided, settlements can develop/continue several months or years after completion of the project. In addition, clay or concrete cut-off walls should be installed to interrupt the granular bedding section

to reduce the rates and volumes of water transmitted along the utility alignment which can contribute to migration of fines.

If granular bedding is specified, the contractor should anticipate that significant volumes of on-site soils may not be suitable for that use. Materials proposed for use as pipe bedding should be tested by a geotechnical engineer for suitability prior to use. Imported materials should be tested and approved by a geotechnical engineer prior to transport to the site.

SURFACE DRAINAGE

The following drainage measures are recommended for design, construction, and should be maintained at all times after the project has been completed:

- 1) Wetting or drying of the foundation excavations and underslab areas should be avoided during and after construction as well as throughout the improvements' design life. Permitting increases/variations in moisture to the adjacent or supporting soils may result in a decrease in bearing capacity and an increase in volume change of the underlying soils and/or differential movement.
- 2) Positive surface drainage measures should be provided and maintained to reduce water infiltration into foundation soils. The ground surface surrounding the exterior of each building should be sloped to drain away from the foundation in all directions. We recommend a minimum slope of 12 inches in the first 10 feet in the areas not covered with pavement or concrete slabs, or a minimum 3 percent in the first 10 feet in the areas covered with pavement or concrete slabs. Reducing the slopes to comply with ADA requirements may be necessary but may result in an increased potential for moisture infiltration and subsequent volume change of the underling soils. In no case should water be allowed to pond near or adjacent to foundation elements. However, if positive surface drainage is implemented and maintained directing moisture away from the building, lesser slopes can be utilized.

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Larimer County, Colorado**

- 3) On some sites it is common to have slopes descending toward buildings. Such slopes can be created during grading even on comparatively flat sites. In such cases, even where the recommendation above regarding slopes adjacent to the building is followed, water may flow to and beneath the building with resultant additional post-construction movements. Where the final site configuration includes graded or retained slopes descending toward the building or flatwork, interceptor drains should be installed between the building and the slope. In addition, where irrigation is applied on or above slopes, drainage structures commonly are needed near the toe-of-slope to prevent on-going or recurrent wet conditions.
- 4) In no case should water be permitted to pond adjacent to or on sidewalks, hardscaping, or other improvements as well as utility trench alignments, which are likely to be adversely affected by moisture-volume changes in the underlying soils or flow of infiltrating water.
- 5) Roof downspouts and drains should discharge well beyond the perimeters of the structure foundations, or be provided with positive conveyance off-site for collected waters.
- 6) Vegetation that may require watering should ideally be located 10 or more feet from building perimeters, flatwork, or other site improvements. Even so, we understand that some municipalities and developments have certain requirements for landscaping near the building. Therefore, less than 10 feet is acceptable provided that positive, effective surface drainage is initially implemented and maintained throughout the life of the facility. Irrigation sprinkler heads should be deployed so that applied water is not introduced near or into foundation/subgrade soils. The area surrounding the perimeter of the building should be constructed so that the surface drains away from the structure. Additionally, it is very important that landscape maintenance is performed such that the amount of moisture is strictly controlled so that the quantity of moisture applied is limited to that which is necessary to sustain the vegetation; in no case should saturated or marshy conditions be allowed to occur near any of the site improvements (including throughout the landscaped islands in parking areas). Periodic inspections should be made

by facility representatives to make sure that the landscape irrigation is functioning properly and that excess moisture is not observed.

- 7) Use of drip irrigation systems can be beneficial for reducing over-spray beyond planters. Drip irrigation can also be beneficial for reducing the amounts of water introduced to foundation/subgrade soils, but only if the total volumes of applied water are controlled with regard to limiting that introduction. Controlling rates of moisture increase in foundation/subgrade soils should take higher priority than minimizing landscape plant losses.
- 8) Where plantings are desired within 10 feet of a building, GROUND recommends that the plants be placed in water-tight planters, constructed either in-ground or above-grade, to reduce moisture infiltration in the surrounding subgrade soils. Planters should be provided with positive drainage and landscape underdrains.
- 9) Plastic membranes should not be used to cover the ground surface adjacent to foundation walls. Perforated “weed barrier” membranes that allow ready evaporation from the underlying soils may be used.

CLOSURE

Geotechnical Review

The author of this report or a company principal should be retained to review project plans and specifications to evaluate whether they comply with the intent of the recommendations in this report. The review should be requested in writing.

The geotechnical recommendations presented in this report are contingent upon observation and testing of project earthworks by representatives of GROUND. If another geotechnical consultant is selected to provide materials testing, then that consultant must assume all responsibility for the geotechnical aspects of the project by concurring in writing with the recommendations in this report, or by providing alternative recommendations.

Materials Testing

The client should consider retaining a Geotechnical Engineer to perform materials testing during construction. The performance of such testing or lack thereof, in no way alleviates the burden of the contractor or subcontractor from constructing in a manner that conforms to applicable project documents and industry standards. The contractor or pertinent subcontractor is ultimately responsible for managing the quality of their work; furthermore, testing by the geotechnical engineer does not preclude the contractor from obtaining or providing whatever services they deem necessary to complete the project in accordance with applicable documents.

Limitations

This report has been prepared for JVA, Inc. as it pertains to design of the proposed River Glen Lift Station and associated force main as described herein. It may not contain sufficient information for other parties or other purposes. The owner or any prospective buyer relying upon this report must be made aware of and must agree to the terms, conditions, and liability limitations outlined in the proposal.

In addition, GROUND has assumed that project construction will commence by Fall 2013. Any changes in project plans or schedule should be brought to the attention of the Geotechnical Engineer, in order that the geotechnical recommendations may be re-evaluated and, as necessary, modified.

The geotechnical conclusions and recommendations in this report relied upon subsurface exploration at a limited number of exploration points, as shown in Figure 1a and 1b, as well as the means and methods described herein. Subsurface conditions were interpolated between and extrapolated beyond these locations. It is not possible to guarantee the subsurface conditions are as indicated in this report. Actual conditions exposed during construction may differ from those encountered during site exploration.

If during construction, surface, soil, bedrock, or groundwater conditions appear to be at variance with those described herein, the Geotechnical Engineer should be advised at once, so that re-evaluation of the recommendations may be made in a timely manner. In addition, a contractor who relies upon this report for development of his scope of work or cost estimates may find the geotechnical information in this report to be inadequate for his purposes or find the geotechnical conditions described herein to be at variance with his experience in the greater project area. The contractor is responsible for obtaining the additional geotechnical information that is necessary to develop his workscope and

cost estimates with sufficient precision. This includes current depths to groundwater, etc.

The materials present on-site are stable at their natural moisture content, but may change volume or lose bearing capacity or stability with changes in moisture content. Performance of the proposed structures and pavement will depend on implementation of the recommendations in this report and on proper maintenance after construction is completed. Because water is a significant cause of volume change in soils and rock, allowing moisture infiltration may result in movements, some of which will exceed estimates provided herein and should therefore be expected by the owner.

This report was prepared in accordance with generally accepted soil and foundation engineering practice in the project area at the date of preparation. GROUND makes no warranties, either expressed or implied, as to the professional data, opinions or recommendations contained herein. Because of numerous considerations that are beyond GROUND's control, the economic or technical performance of the project cannot be guaranteed in any respect.

ALL DEVELOPMENT CONTAINS INHERENT RISKS. It is important that ALL aspects of this report, as well as the estimated performance (and limitations with any such estimations) of proposed project improvements are understood by JVA Inc., Project Owner (if different), or properly conveyed to any future owner(s). Utilizing these recommendations for planning, design, and/or construction constitutes understanding and acceptance of recommendations or information provided herein, potential risks, associated improvement performance, as well as the limitations inherent within such estimations. If any information referred to herein is not well understood, it is imperative for JVA Inc., Owner (if different), or anyone using this report to contact the author or a company principal immediately.

**River Glen Waste Water Treatment Facility Improvements
Larimer County, Colorado**

GROUND appreciates the opportunity to complete this portion of the project and welcomes the opportunity to provide the Owner with a cost proposal for construction observation and materials testing prior to construction commencement.

Sincerely,
GROUND Engineering Consultants, Inc.



Kelsey Van Bommel, P.E.

Reviewed by Joseph Zorack, P.E



1



Indicates test hole number and approximate location.



(Not to Scale)

GROUND

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LOCATION OF TEST HOLES

JOB NO.: 13-0022

FIGURE: 1a

CADFILE NAME: 0022SITE1.DWG



1
 ⊕ Indicates test hole number and approximate location.



(Not to Scale)

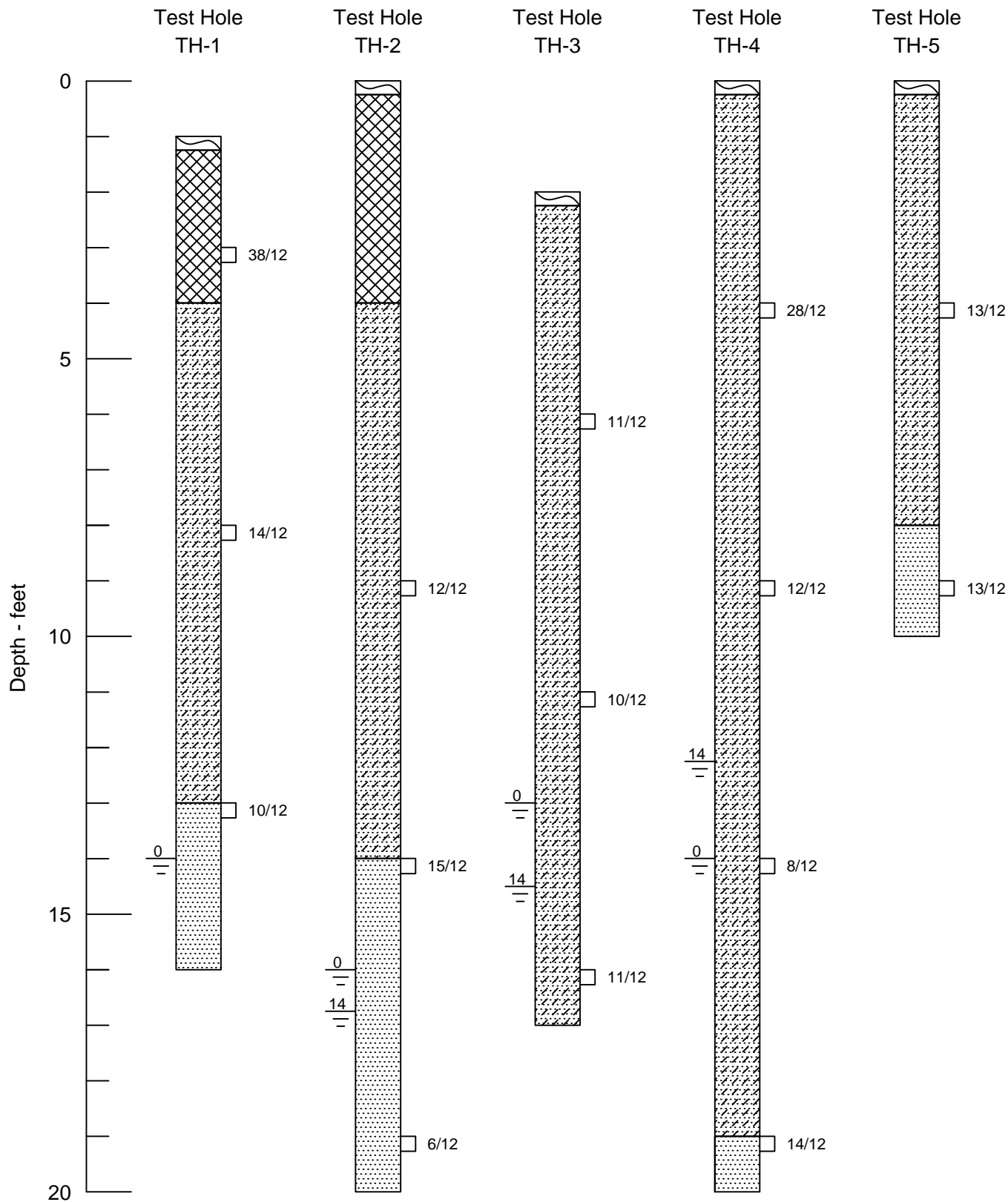
GROUND
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LOCATION OF TEST HOLES

JOB NO.: 13-0022

FIGURE: 1b

CADFILE NAME: 0022SITE2.DWG



Note: TH-1 to TH-3 are within the existing River Glen Treatment Facility and are hung based on elevations within 1974 plans. 0 represents the top of the south lagoon berm elevation.

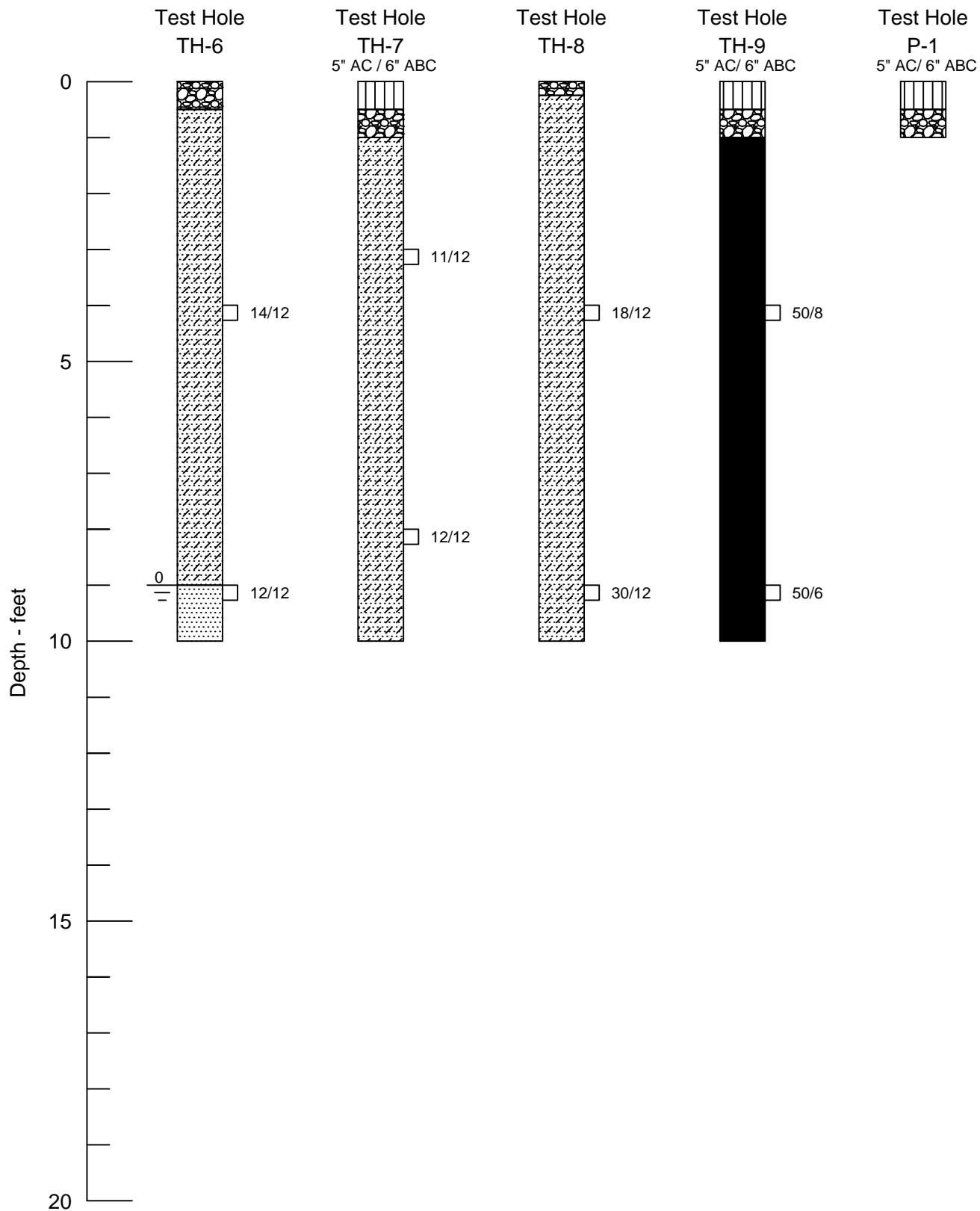
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LOGS OF TEST HOLES

JOB NO.: 13-0022

FIGURE: 2

CADFILE NAME: 0022LOG01.DWG



GROUND
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LOGS OF TEST HOLES

JOB NO.: 13-0022

FIGURE: 3

CADFILE NAME: 0022LOG02.DWG

LEGEND:



Topsoil



Asphalt



Base Course



Fill: Sandy clay materials and were fine to medium grained, low to medium plastic, dry to slightly moist, and brown in color.



Sand and Clay: Materials ranged from sandy clay to clayey sand were occasionally silty, fine to medium grained with local gravel lenses, low to medium plastic, loose/medium to dens/very stiff, moist to wet, and light brown to dark brown in color with occasional calcite.



Sand: Clayey to silty, fine to coarse grained with occasional gravel, low plasticity to non-plastic, loose to medium dense, moist to wet, and brown to tan in color.



Claystone Bedrock: Fine grained with local sandstone lenses, medium to highly plastic, hard to very hard, dry to slightly moist, and gray-blue in color with occasional iron staining.



Drive sample, 2-inch I.D. California liner sample

23/12

Drive sample blow count, indicates 23 blows of a 140-pound hammer falling 30 inches were required to drive the sampler 12 inches.



Depth to water level and number of days after drilling that measurement was taken.

NOTES:

- 1) Test holes were drilled on 07/05/2013 with 4-inch diameter continuous flight augers.
- 2) Locations of the test holes were measured approximately by pacing from features shown on the site plan provided.
- 3) Elevations of the test holes were not measured and the logs of the test holes are drawn to depth.
- 4) The test hole locations and elevations should be considered accurate only to the degree implied by the method used.
- 5) The lines between materials shown on the test hole logs represent the approximate boundaries between material types and the transitions may be gradual.
- 6) Groundwater level readings shown on the logs were made at the time and under the conditions indicated. Fluctuations in the water level may occur with time.
- 7) The material descriptions on this legend are for general classification purposes only. See the full text of this report for descriptions of the site materials and related recommendations.

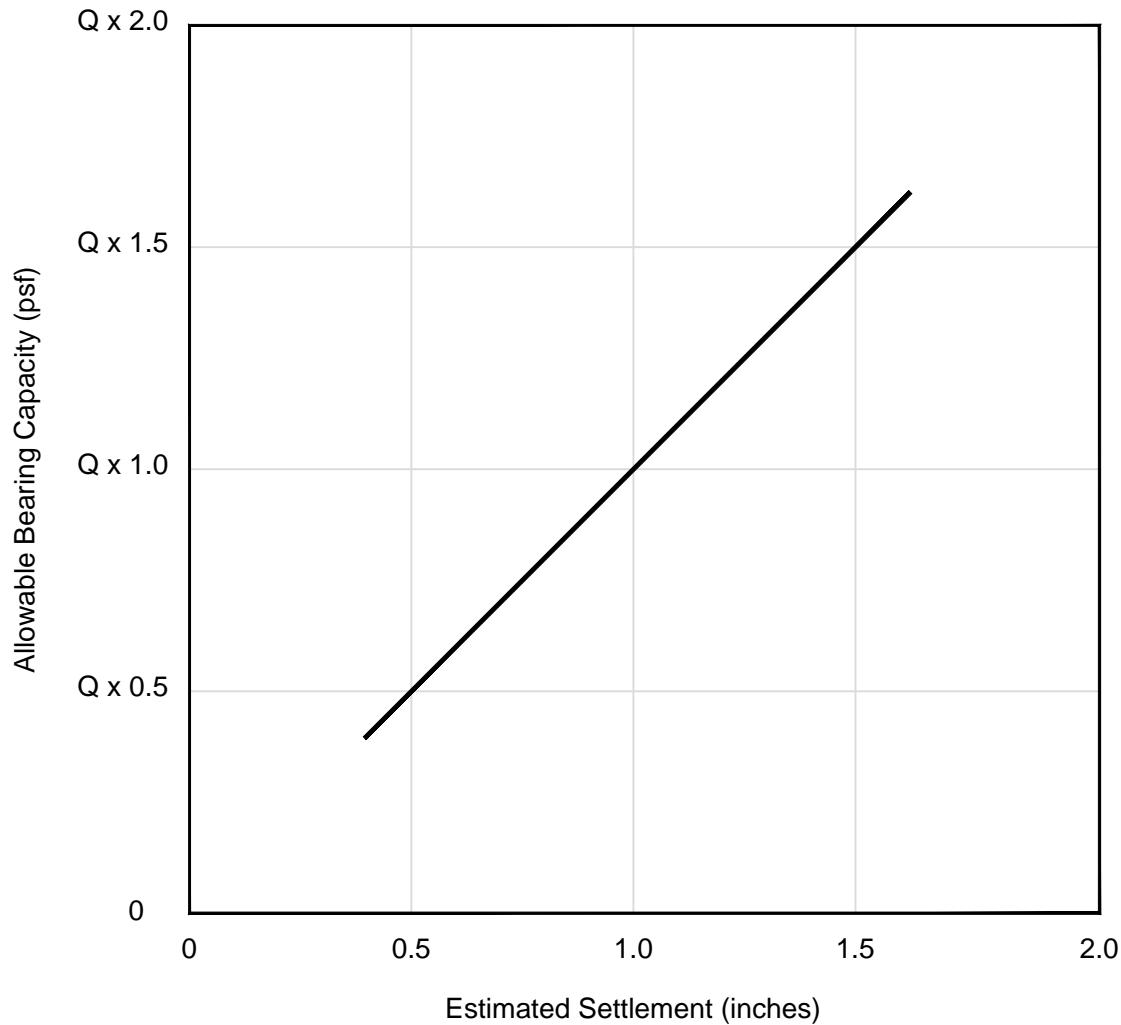
GROUND
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LEGEND AND NOTES

JOB NO.: 13-0022

FIGURE: 4

CADFILE NAME: 0022LEG.DWG



$Q = 2,000 \text{ psf}$

Note: Design should be controlled by settlement. Estimated settlement values indicated above are based on drained conditions. If foundation materials become wet, the allowable bearing capacity will be reduced and result in larger estimated settlement. This relationship is based on footing widths of 1 to 4 feet. If the footing width is to be greater than 4 feet, we should be notified to reevaluate these recommendations.

GROUND

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BEARING CAPACITY CHART

JOB NO.: 13-0022

FIGURE: 5

CADFILE NAME: 0022BRCP.DWG

GROUND
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TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Passing No. 200 Sieve	Atterberg Limits		Water Soluble Sulfates (%)	USCS Classifi- cation	Soil or Bedrock Type
Test Hole No.	Depth (feet)				Liquid Limit	Plasticity Index			
TH-1	7	12.0	111.3	78	30	11	0.09	CL	Sandy Clay
TH-2	14	10.4	-	13	NA	NP	-	SM	Silty Sand
TH-3	4	9.9	100.2	71	26	5	-	CL/ML	Sandy Silt and Clay
TH-4	9	16.0	109.1	41	24	3	-	SM/SC	Silty Clayey Sand
TH-6	4	15.5	113.9	60	27	12	-	CL	Sandy Clay
TH-7	8	14.8	111.6	53	28	14	-	SC/CL	Sand and Clay
TH-8	4	13.8	109.2	68	35	20	-	CL	Sandy Clay
TH-9	4	12.8	119.3	83	35	18	-	CL	Claystone

Job No. 13-0022

SECTION 01035

MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

1.2 MINOR CHANGES IN THE WORK

- A. Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on a Field Order Form
- B. The Contractor may request additional information or clarification by generating and submitting a "Request for Information" (RFI) to Engineer. All RFIs will be tracked by Engineer and Contractor in a common document

1.3 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: The Engineer will issue a detailed Proposal Request Form indicating changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. The Proposal Request Form issued by the Engineer is for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
 - 2. Within 7 days of receipt of a Proposal Request Form, submit an estimate of cost necessary to execute the change to the Engineer for the Owner's review.
 - a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a Contractor request for a change form to the Engineer
 - 1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
 - 2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
- C. Proposal Request Form: Use Proposal Request Form for a Change Order or similar form as approved by the Owner.
- D. There will be no Contractor initiated Change Orders, the Contractor may only request additional information or clarification by using and submitting a "Request for Information" (RFI), on the Contractor's RFI form as approved by the Engineer. Additional forms may be obtained from the Engineer.

1.4 WORK CHANGE DIRECTIVE

- A. Work Change Directive: When the Owner and the Contractor disagree on the terms of a Proposal Request, the Engineer may issue a Work Change Directive. The Work Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. The Work Change Directive contains a complete description of the change in the Work and the change in Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
 1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.5 CHANGE ORDER PROCEDURES

- A. Upon the Owner's and the Engineer's approval and signature from the Contractor the Proposal Request Form becomes a Change Order

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination
- B. Preconstruction conference
- C. Progress meetings
- D. Requests for information

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01340 – Shop Drawings and Product Data
- C. Section 01700 – Contract Closeout

1.3 COORDINATION

- A. Coordinate scheduling, submittals, and Work included in various Sections of Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Make adequate provisions to accommodate items scheduled for later installation
 - 3. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings
 - a. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required
- B. Administrative procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of others to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Schedule of Values
 - 2. Construction Progress Schedule
 - 3. Request for Interpretation (RFIs)
 - 4. Request for Substitutions
 - 5. Delivery and Processing of Submittals: Shop drawings, product data, and samples

6. Test and inspection reports
 7. Progress meetings
 8. Manufacturer's instructions and field reports
 9. Contract closeout activities
- C. Verify that utility requirement characteristics of operating equipment are compatible with available utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment, and coordinate preparation of grading and other requirements for installation utility work by others.
- D. Coordinate completion and clean up of Work of separate Sections in preparation for final completion and for portions of Work designated for Owner's use
- E. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.4 PRECONSTRUCTION CONFERENCE

- A. Engineer will schedule and administer pre-construction meeting after the Notice of Award. Contractor will be notified no less than 7 days in advance of meeting date.
- B. Engineer will prepare agenda for meeting and include items required by Owner and Contractor
- C. Location: JVA Office, 1319 Spruce St. Boulder, CO 80302
- D. Attendance
1. Owner's Representative
 2. Engineer and Engineer's professional consultants
 3. Contractor's Project Manager
 4. Contractor's Superintendent
 5. Major Subcontractors
 6. Others as Appropriate
- E. Agenda:
1. Execution of Owner Contractor Agreement
 2. Submission of executed bonds and insurance certificates
 3. Distribution of Contract Documents
 4. Submission of list of subcontractors and suppliers, list of products, Schedule of Values, and progress schedule
 5. Designation of personnel representing the parties in Contractor, Owner, and the Engineer and lines of communication
 6. Project coordination
 7. Procedures and processing of field decisions, submittals, substitutions, RFIs, applications for payments, cost proposal requests, Change Orders and Contract closeout procedures
 8. Construction scheduling, phasing, and updates

9. Scheduling activities of Geotechnical Engineer, equipment manufacturers representatives, and other field tests
10. Critical work sequencing under Contract, work under separate contracts of Owner, and long-lead items
11. Major equipment deliveries and priorities
12. Procedures for preparing and maintaining Record Documents
13. Use of premises
 - a. Office, work, storage, laydown, and parking areas
 - b. Owner's requirements
 - c. Work restrictions and hours
14. Construction facilities, controls and construction aids
15. Temporary utilities provided by Contractor
16. Safety and first-aid procedures
17. Security and housekeeping procedures
18. Procedures for testing

F. Reporting:

1. Within seven (7) working days after the preconstruction meeting, Engineer will prepare and distribute minutes of meeting to representative parties
2. Contractor shall provide copies to subcontractors and major suppliers

1.5 PROGRESS MEETINGS

- A. Contractor will schedule and administer site mobilization and weekly progress meetings throughout progress of the Work at weekly intervals and at other times requested by the Owner. If work progress does not warrant meeting, all parties can mutually agree to postpone the weekly meeting.
 1. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within one week to Contractor, Owner, Engineer, participants, and those affected by decisions made.
 2. Contractor shall record the minutes; include all significant proceedings, decisions and items requiring action along with due dates. Engineer and Owner shall have an opportunity to review meeting notes prior to Contractor issuing final account.
 3. Owner, other inspecting parties, and facility operators may attend weekly meetings. Engineer will coordinate with Owner for attendance for meetings, and will attend most meetings on site
- D. Representatives of contractors, subcontractors, and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents
- B. Location of the Meetings: The project field office of the Contractor, or other locations arranged for by Contractor, convenient to all parties
- C. Attendance
 1. Owner's Representative
 2. Engineer and Engineer's professional consultants as needed
 3. Contractor's Superintendent
 4. Subcontractors as appropriate to the agenda

5. Suppliers as appropriate to the agenda
6. Others, as appropriate

D. Suggested Meeting Agenda

1. Review Minutes of Previous meeting and construction progress since previous meeting
2. Review unresolved issues from Last Meeting
3. Review of Work Progress
4. Field Observations, Problems, Conflicts and Decisions
5. Issues that may impede the construction schedule
6. RFI Review
7. Review of Submittals Schedule and Status of Submittals
8. Site use: Coordination with other contractors
9. Temporary facilities, controls and services
10. Work hours
11. Schedule
 - a. General Schedule Issues
 - b. Review of off-site fabrication and delivery schedules
 - c. Planned progress during succeeding work period (3-week-“Look ahead”)
 - d. Maintenance of project schedule
 - e. Corrective measure to regain project schedules
12. Maintenance of Quality and Work Standards
13. Change Orders
14. New PR's
15. Accepted Change Orders
16. Pay Requests
17. Revisions to construction schedule
18. Other Business

1.6 PRE-INSTALLATION CONFERENCES

- A. Contractor will schedule and administer meetings before installation of lift station equipment
- B. Location of the Meetings: The project field office of the Contractor, or other locations arranged for by Contractor, convenient to all parties
- C. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within one week to Contractor, Owner, Engineer, participants, and those affected by decisions made.
- D. Attendance
 1. Owner's Representative
 2. Engineer and Engineer's professional consultants as needed
 3. Contractor's Superintendent
 4. Subcontractors as appropriate to the agenda
 5. Suppliers as appropriate to the agenda
 6. Others, as appropriate

E. Suggested Meeting Agenda

1. Construction progress
 - a. Projected construction progress upon equipment installation
 - b. Required phasing
 - c. Review of schedule limitations
 - d. Possible conflicts and installation problems
 - e. Weather limitations
 - f. Review of submittals and manufacturer's recommendations
 - g. Warranty provisions
 - h. Inspection, testing, and start-up
 - i. Performance requirements

F. Reporting:

1. Within seven (7) working days after each meeting, Contractor will prepare and distribute minutes of meeting to Engineer
2. Contractor shall distribute copies to principal subcontractors and suppliers

1.7 STARTUP COORDINATION MEETING

- A. Contractor will schedule and administer meetings at least fourteen (14) days before start up of first piece of lift station equipment

B. Suggested Meeting Agenda:

1. Review of start-up procedures
2. Identification of any hazards, safety precautions, or risks
3. Any potential deviations from proposed startup protocol
4. Any issues affecting startup, including phasing of other equipment startups
5. Construction scheduling affecting startup
6. Performance testing
7. Review of pre-startup quality assurance and quality control
8. Warranty issues
9. Other items as appropriate

- C. After Startup Coordination Meetings, Contractor shall prepare a schedule of equipment startups and submit to Engineer for concurrence.

1.8 REQUESTS FOR INFORMATION (RFIS)

- A. The Contractor shall prepare and submit an RFI upon the discovery of the need for interpretation of the Contract Documents or additional information.
1. Only the Contractor shall submit RFIs to the Engineer.
 2. RFIs shall be submitted on Engineer's RFI form. Engineer will provide a template for the Contractor upon request.
- B. RFI shall include:
1. Project Name
 2. Engineer Job Number
 3. Date
 4. Name of Contractor

5. Name of Engineer
 6. RFI number, numbered sequentially
 7. Related specification section number, title, and related paragraphs, as needed
 8. Drawing number and detail references, as needed
 9. Field conditions
 10. Contractor's proposed solution. If the Contractor's solution(s) affect contract times or contract price, Contractor shall state the effects on the RFI.
 11. Contractor's signature
 12. Relevant attachments including but not limited to drawings, descriptions, measurements, photos, product data, and shop drawings
- C. Electronically Submitted RFIs
1. Contractor shall submit one (1) complete RFI file in Adobe Acrobat PDF format
- D. Engineer's Response
1. Engineer will review each RFI, determine action required, and respond.
 2. Engineer will review and respond to each RFI within seven (7) working days
 3. If Engineer receives an RFI after 1:00 P.M. local time, the RFI will be considered as received the following working day.
 4. Engineer will not respond to RFIs requesting approval of submittals, approval of substitutions, coordination and information already indicated in Contract Documents, adjustment in contract time or contract amount, or erroneous RFIs.
 5. Engineer may respond to RFIs on related issues with a single response.
 6. If Engineer requests additional information as a result of the RFI, any further action or RFIs submitted by the Contractor will restart a new seven (7) day review period.
 7. Contractor shall submit any request for change of contract time or contract price utilizing proper Change Order forms.
- E. Contractor shall log and track all RFIs submitted organized by RFI number.
1. RFI log shall be submitted at each progress meeting
 2. RFI log shall include:
 - a. Project name
 - b. Name, address, and phone number of Contractor
 - c. Contractor representative name
 - d. RFI number
 - e. RFI description
 - f. RFI submittal date
 - g. RFI response date
 - h. Related Change Order number, as needed

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01200

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.
- B. This information is supplemental to the requirements as stated in the General Conditions.

1.2 SUMMARY

- A. This Section includes additional administrative and procedural requirements necessary to prepare and process Applications for Payment. Refer to General Conditions for most requirements of the Owner.
 - 1. Schedule of Values assisting in processing Applications for Payment
 - 2. State Revolving Loan Fund project administrative requirements
 - 3. Construction Progress Schedules

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 PROCEDURES FOR THE SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets
 - b. Submittals Schedule
 - c. O&M Manuals Schedule
 - 2. Submit the Schedule of Values to Engineer at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment
 - 3. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: include the following Project identification on the Schedule of Values:

- a. Project name and location
 - b. Name of Engineer
 - c. Engineer's project number.
 - d. Contractor's name and address
 - e. Date of submittal
2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Change Orders (numbers) that affect value.
 - d. Dollar value.
 - e. Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders result in a change in the Contract Sum.

1.5 APPLICATION FOR PAYMENTS

A. General

1. Submit itemized payment request as required in General Conditions together with Schedule of Values and other submittals as specified herein
2. Contractor shall not "project" work completed beyond the date of Application for Payment submittal for the purpose of payment request

- B. Each Application for Payment shall be consistent with previous applications and payments as certified by the Engineer and paid for by the Owner.
 - 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements
- C. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application or Payment is the period indicated in the Agreement
- D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
 - 2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application
- E. Transmittal
 - 1. Submit copy of each Application for Payment to the Engineer by means ensuring receipt within 24 hours
 - 2. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Engineer
- F. Initial Application for Payment
 - 1. Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
 - a. List of subcontractors
 - b. List of principal suppliers and fabricators
 - c. Schedule of Values
 - d. Contractor's Construction Schedule (preliminary if not final)
 - e. Schedule of principal products
 - f. List of Contractor's staff assignments
 - g. Copies of building and excavation
 - h. Copies of authorizations and licenses from governing authorities for performance of the Work
 - i. Certificates of insurance and insurance policies
 - j. Performance and payment bonds, if required
- G. Application for Payment at Substantial Completion
 - 1. Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of Work
 - a. Administrative actions and submittals that shall precede or coincide with this application include:

- i) Occupancy permits and similar approvals
- ii) Warranties (guarantees) and maintenance agreements
- iii) Test/adjust/balance records
- iv) Maintenance instructions
- v) Meter readings
- vi) Start-up performance reports
- vii) Change-over information related to Owner's occupancy, use, operation and maintenance
- viii) Final cleaning
- ix) Application for reduction of retainage, and consent of surety
- x) Advice on shifting insurance coverages
- b. List of incomplete Work, recognized as exceptions to Engineer's Certificate of Substantial Completion

H. Application for Final Payment

1. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.
2. Application for Final Payment will not be considered until the following have been accomplished:
 - a. Completion of Project closeout requirements
 - b. Completion of items specified for completion after Substantial Completion
 - c. Assurance that unsettled claims will be settled
 - d. Assurance that Work not complete and accepted will be completed without undue delay
 - e. Transmittal of required Project construction records to Owner
 - f. Proof that taxes, fees and similar obligations have been paid
 - g. Removal of temporary facilities and services
 - h. Removal of surplus materials, rubbish and similar elements

1.6 PROCEDURES FOR STATE REVOLVING FUND (SRF) LOAN PROJECTS

- A. Coordination: coordinate preparation of the SRF forms and reports with preparation of Contractor's Construction Schedule and Pay Applications
 1. Correlate line items in the Project Schedule with other required administrative forms and schedules, including the following:
 - a. Certifications regarding debarment (General and Subcontractors)
 - b. Certified payrolls (Davis-Bacon wage determination)
 - c. Disadvantaged Business Enterprise (DBE) Procurement
 2. Make required submittals to the Engineer on a timely basis based on monthly and quarterly reporting requirements

1.7 PROCEDURES FOR THE CONSTRUCTION PROGRESS SCHEDULE

- A. Coordination: coordinate preparation and updates of Contractor's Construction Schedule with the preparation of Schedule of Values.
 1. Correlate line items in the Construction Schedule with required project tasks, including the following:

- a. Mobilization/demobilization
 - b. Permits and regulatory requirements
 - c. Submittals
 - d. Equipment
 - e. O&M Manuals
 - f. Work breakdown of major project work
 - g. Major subcontractors work
 - h. Startup and commissioning
 - i. Training
 - j. Substantial completion
 - k. Final completion
 - l. Milestones and operational shutdown requirements
- B. Utilize the Critical Path Method (CPM) type construction schedule to establish preliminary progress schedule and track Work progress
1. After acceptance by Engineer of preliminary Progress Schedule submitted per requirements of General Conditions, set preliminary Progress Schedule as the Construction Baseline Schedule
 2. Update and submit the construction progress schedule on a monthly basis with the pay application
 - a. Monthly submittal should indicate progress of tasks, changes to baseline schedule logic, work additions such as change orders, milestone and contract date changes
 - b. Submit two (2) color print copies, 11" x 17" size, and one Adobe pdf copy
 - c. Upon request provide copy of project schedule CPM data file

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submission of all shop drawings and product data as required by the Contract Documents for all equipment and materials to be furnished under this contract unless specifically indicated otherwise

1.2 RELATED SECTIONS

- A. Section 01600 – Materials and Equipment
- B. Section 01730 – Operations and Maintenance Data
- C. Specification Divisions 2 thru 16

1.3 SUBMITTALS

- A. Definitions
 - 1. Technical submittals: Shop drawings, product data and samples prepared by Contractor, subcontractors, suppliers, or manufacturers
 - a. Shall be submitted by the Contractor to Engineer for approval for the use of Equipment and Materials to complete the Work or as needed to describe the following:
 - i) Operation and maintenance
 - ii) Technical properties
 - iii) Installation
 - b. Shop drawings: Custom prepared data for the Project and Work including performance and capacity curves, diagrams, bills of material, instructions, and other information
 - c. Product data: Non-custom prepared printed information for the Project and Work on materials and products
 - d. Samples: Fabricated and non-fabricated tangible samples of products and material
 - i) Used for visual inspection and testing and analysis
 - 2. Informational submittals: Reports, administrative informational submittals, certification and guarantees not including and defined as shop drawings, samples and product data
 - a. Reports: Include laboratory reports and tests, technical procedures and records and design analysis
 - b. Administrative informational submittals: Submittals necessary for administrative records such as construction photographs, work records, schedules, standards, record project data, safety data, and similar information submittals
 - c. Certification: Includes manufacturer or supplier certificates and guarantees

B. General Requirements

1. Quality

- a. Shall be of suitable quality for legibility and reproduction purposes
- b. Shall be useable for reproduction yielding legible hard copy
- c. Submittals not conforming to specified requirements herein and as specified in Divisions 2 through 16 shall be subject to rejection by Engineer and upon Engineer request, Contractor shall resubmit documents that are in conformance

2. Dimensions

- a. English units shall be provided on submittals
- b. Metric units are acceptable in addition to English units
- c. English units shall govern

3. Form of submittals

- a. Submittals shall be transmitted in electronic format as specified herein
- b. Scanned submittals are acceptable
- c. Electronic project documents and submittals shall be transmitted in the following format:
 - i) Native electronic format, nonproprietary
 - ii) Adobe PDF produced from native electronic format
- d. Filename:
 - i) Shall be consistent for the initial and any subsequent submission revisions for a single submittal
 - ii) Contractor shall use a consistent naming convention for all submittals
 - a) Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., #001, #001A, #001B, etc.)

4. Non-conforming submittals shall be subject to rejection by Owner and/or Engineer

5. Submittal completion requirements

- a. Submittals shall include design criteria, dimensions, construction materials and all other information specified for a complete submittal to facilitate Engineer review of the submittal information adequately
- b. In the event various drawings are included a submittal for a class of Equipment, Contractor shall annotate clearly which parts apply to furnished Equipment
 - i) Information not pertaining to the submittal shall be clearly annotated. Highlighting of such information will cause rejection of the submittal by the Engineer
- c. Contract Drawings
 - i) Copies or portions thereof will not be allowed as acceptable fabrication or erection drawings
 - ii) In the event Contract Drawings are used by the Engineer for erection drawings to annotate information on erection or identify reference details, Engineer title block and professional seal shall be removed and replaced with the Contractor's title block on the Contract Drawing(s). Contractor shall revise such erection drawings for subsequent revisions by the Engineer to Contract Drawings

C. Preparation

1. Shop Drawings

- a. Drawings shall be presented in a clear and thorough manner:
 - b. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings
 - c. Identify equipment by reference to equipment name and tag number shown on Contract Drawings
 - d. Scale and Measurements: Make drawings accurate to a scale with sufficient detail to show the kind, size, arrangement and function of component materials and devices
 - e. Minimum sheet size: 8.5" by 11"
 - f. Fabrication drawing size: 11" by 17" or 24" by 36"
2. Product Data
- a. Clearly mark each copy to identify pertinent products or models submitted for review
 - b. Identify equipment by reference to equipment name and P&ID number
 - c. Catalog cut sheets: Cross-out or hatch irrelevant data
- D. Technical Submittals: Shop Drawings and Product Data Submittal Requirements
1. Shop Drawings and Product Data shall include the following, at a minimum:
- a. Specifications of manufacturer(s)
 - b. Equipment parts and catalogs
 - c. Bills of materials, material lists, and schedules
 - d. Shop erection and fabrication drawings
 - e. Drawings shall include equipment dimensions, weights, installation location requirements, plates required, main components, support details, anchor bolt details/sizes/locations, support base sizes, baseplate sizes, spacing and clearance requirements for installation, erection, operation and maintenance disassembly
 - f. Electrical requirements:
 - i) Shall include schematic diagrams including one-line diagrams, terminal block numbers, internal wiring diagrams, external connections, controls, and any other information as requested in individual specification sections
 - g. List of spare parts
 - h. Instruction and Operation and Maintenance (O&M) manuals
 - i) As specified herein and in Specification Section 01730
 - i. Manufacturer's performance testing of equipment
 - j. Concrete mix design data and information
 - k. Performance characteristics and capacities
 - l. External connections, anchorages, and supports required
 - m. Other drawings, parts, catalogs, specifications, samples, or data necessary for the Engineer to determine conformance with Contract Documents
2. Samples – Office samples shall be of sufficient size and quantity to clearly illustrate:
- a. Functional characteristics of the product, with integrally related parts and attachment devices
 - b. Full range of color, texture and pattern
 - c. Comply with requirements identified in individual specification sections

- E. Construction Schedule: Designate in the construction schedule, or in a separate coordinated shop drawing schedule, the dates for submission and the dates that reviewed Shop Drawings and Product Data will be needed, if accelerated review is requested
- F. Field samples and Mock-ups:
 - 1. Contractor shall erect, at the Project Site, at a location acceptable to the Engineer and Owner
 - 2. Size or area: as specified in the respective specification section
 - 3. Fabricate each sample and mock-up complete and finished
 - 4. Remove mock-ups at conclusion of Work or when acceptable to Engineer

1.4 CONTRACTOR RESPONSIBILITIES

- A. Review shop drawings and product data prior to submission for accuracy and completeness of each submission
- B. Approve and stamp each submission before submitting to Engineer
- C. Determine and verify:
 - 1. Field measurements
 - 2. Field construction criteria
 - 3. Catalog numbers and similar data
 - 4. Conformance with specifications and identification of all deviations
 - 5. Confirm assignment of unit responsibility
- D. Prior to each submission, carefully review and coordinate all aspects of each item being submitted
- E. Verify that each item and the corresponding submittal conform in all respects with specified requirements of the Work and of the Contract Documents with respect to means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto
- F. Make submissions promptly in accordance with Construction Schedule, and in such sequence as to cause no delay in the Work or in the work of any other Contractor
- G. Limit requirement for accelerated submittal review by Engineer to no more than 10% percent of total number of submittals
 - 1. Accelerated submittal review period: less than 7 calendar days
- H. Notify Engineer in writing, at time of submission, of any deviations in the submittals from Contract Document requirements:
 - 1. Identify and tabulate all deviations in transmittal letter
 - 2. Indicate essential details of all changes proposed, including modifications to other facilities that may be a result of the deviation
 - 3. Include required piping and wiring diagrams

1.5 SUBMISSION REQUIREMENTS

- A. Make submissions far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmissions, and for placing orders and securing delivery
- B. In scheduling, allow fourteen (14) calendar days for review by Engineer following receipt of submission in Engineer's office:
 - 1. Provide submittals electronically. Time required to mail submissions or resubmissions is not considered a part of review period
- C. Submittal Naming and Numbering
 - 1. Assign a unique number to include all shop drawings, product data and other information required for individual specification sections, beginning with #001.
 - 2. Resubmissions shall have the original number with a letter, starting with "A". If the first submittal required resubmission, it would be labeled #001A.
 - 3. Each specification section may still have more than one submittal number for later submissions (i.e., Preliminary O&M Manuals, Final O&M Manuals, etc.)
 - 4. Contractor shall use a consistent naming convention for all submittals
- D. Quantity of Submittals Required
 - 1. Shop Drawings and Product Data:
 - a. Initial submittal:
 - i) Electronic – One (1) copy to Engineer
 - b. Resubmittal:
 - i) Electronic – One (1) copy to Engineer
 - c. Final Submittal for Distribution
 - i) Paper hard copy - Maximum of two (2) copies for Contractor's use, plus a maximum of three (3) copies which will be distributed by Engineer when approved. Do not submit more than five (5) copies
 - ii) One (1) electronic copy to Engineer
 - d. As –constructed document submittals
 - i) Paper hard copy – Maximum of two (2) copies for Contractor's use, plus a maximum of three (3) copies which will be distributed by Engineer when approved. Do not submit more than five (5) copies
 - ii) Electronic – One (1) copy to Engineer and one (1) copy to Owner
 - 2. Samples
 - a. Initial submittal:
 - i) Submit two (2) of each sample unless specified otherwise in individual specification section
 - b. Resubmittal:
 - i) Submit two (2) to Engineer
 - c. One (1) sample of approved sample submittal will be returned to Contractor
 - 3. Informational submittals
 - a. Technical reports and administrative submittals
 - i) Electronic – One (1) copy to Engineer
 - b. Certificates and guarantees:
 - i) Electronic – One (1) copy to Engineer

- ii) Paper: Two (2) copies to Engineer
 - c. Test reports
 - i) Paper
 - a) Owner: One (2) copies
 - b) Engineer: One (1) copy
 - c) Contractor: Two (2) copies
 - d) Manufacturer/supplier: One (1) copy
 - 4. Instruction and O&M manuals
 - a. In accordance to Specification Section 01730
 - 5. At no additional cost to the Owner and whether or not submittals are copyrighted, the Owner may copy and use for staff training and/or internal operations any submittals approved for final distribution as well as required by this Contract
- E. Submittal Transmittal Requirements
- 1. Accompany each submittal with a letter of transmittal showing all information required for identification and checking
 - 2. Shall include:
 - a. Drawing numbers and titles
 - b. Revision number
 - c. Electronic filename
 - d. Deviations from Contract Documents: As specified herein
 - e. Submittals unidentifiable will be returned for proper identification
 - f. Date
- F. Submittals Requirements
- 1. Submittal number
 - 2. Date of submission and dates of any previous submissions
 - 3. Project title and number
 - 4. Owner Contract identification number if applicable
 - 5. Names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
 - 6. Identification of the product, with the specification section number
 - 7. Field dimensions, clearly identified as such
 - 8. Relation to adjacent or critical features of the Work or materials
 - 9. Applicable standards, such as ASTM or Federal Specification numbers
 - 10. Identification of deviations from Contract Documents:
 - a. If Contractor proposes to provide material or equipment of Work which deviates from the Project Manual, Contractor shall indicate so under “deviations” on the transmittal form accompanying the submittal copies
 - b. Identify all requested deviations as specified and on the copies of Specifications and Drawings required by paragraph below.
 - 11. Confirmation of compliance with Contract Documents and, if applicable, identification of deviations from Contract Documents:
 - a. Provide the following documents to demonstrate compliance with the contract specifications:

- i) A copy of the relevant Drawing(s) with all addendum updates that apply to the equipment in various Divisions marked to show specific changes necessary for the equipment proposed in the Contractor's submittal
 - a) If no changes are required, the Drawing(s) shall be clearly marked "No Changes Required"
 - b) Failure to include copies of relevant Drawing(s) with the submittal, whether changes are required or not, shall be cause for rejection of the entire submittal with no further review by Engineer
 - c) Relevant Drawing(s) include as a minimum the control diagrams, process and instrumentation diagrams (P&IDs), and Process (P) drawings.
 - ii) A copy of each pertinent specification section with all addendum updates included, all referenced and applicable specifications sections, with their respective addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements:
 - a) If deviations from the specifications are indicated and, therefore requested, by the Contractor, the submittal shall be accompanied by a detailed, written justification for each deviation
 - b) Failure to include a copy of the marked up specification sections, along with justification for any requested deviations to the specification requirements, with the submittal shall be cause for rejection of the entire submittal with no further review by Engineer
12. Identification of revisions on resubmissions
13. An 8" by 4" blank space for Contractor's and Engineer's stamps
14. Stamp cover sheet of each submittal as identified in letter of transmittal
15. Contractor's stamp: Initialed or signed, certifying review and approval of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents. Use stamp to include wording similar to the following:

This submittal has been reviewed by [*Name of Contractor*] and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. [*Name of Contractor*] also warrants that this submittal complies with contract documents and comprises no deviations thereto:

Section No: _____ Submittal No: _____

Date: _____ By: _____

- G. For equipment that is provided directly by manufacturer without specification provide:
- 1. Shop drawings: Illustrate complete assembly of products; foundation, installation and anchor requirements; dimensions and total weights of each, electrical wiring diagrams
 - 2. Product data: Provide manufacturer's literature including general assembly, materials of construction, model and type, detailed data describing parts and accessories, sufficient data to verify compliance with specifications

3. Manufacturer's installation instructions: Provide detailed connection requirements and startup instructions
4. Manufacturer's field report: Indicate personnel present and actual start-up procedures that were performed by manufacturer's representative
5. Field report and test results shall be submitted to the Engineer by the Contractor

H. Submittal Log:

1. Maintain an accurate submittal log for duration of the Work showing current status of all submissions
2. Show submittal number, section number, section title, submittal description, dates and disposition of submittal
3. Make submittal log available to Engineer for Engineer's review upon request

I. Unless specified otherwise, make submissions in groups to facilitate efficient review and approval:

1. Include all associated items from individual specification sections to assure that all information is available for checking each item when it is received
2. Submit a complete initial submittal including all components when an item consists of components from several sources
3. Partial submittals may be rejected as not complying with provisions of the Contract
4. Engineer will not be held liable for delays due to poorly organized or incomplete submissions
5. Do not include items from more than one specification section for any one submittal number

J. Contractor may require subcontractors to provide drawings, setting diagrams and similar information to help coordinate the Work, but such data shall remain between Contractor and his subcontractors and will not be reviewed by Engineer unless specifically called for within the Contract Documents

K. All submittals for each component of multi-component systems shall be compiled and submitted through the Contractor to the Engineer by the manufacturer having System Responsibility

1.6 DISPOSITION OF SHOP DRAWINGS, PRODUCT DATA, AND INFORMATION SUBMITTALS

A. "No Exceptions Taken": Approved with No Corrections Noted

1. One copy sent to Owner
2. One copy retained in Engineer's file
3. Remaining copies returned to Contractor for his use
 - a. One copy to be kept on file at Contractor's office at job site
 - b. Remaining copies for Contractor's office file, suppliers, or subcontractors
4. No corrections or comments noted on the submittal or on a Submittal Response Summary Sheet
5. Issues or miscellaneous comments pertaining to other related items of the Work may be included in transmittal letter
6. Resubmission not required

- B. "Exceptions Noted": Approved with Corrections Noted
 - 1. One copy sent to Owner
 - 2. One copy retained in Engineer's file
 - 3. Remaining copies returned to Contractor for his use
 - a. One copy to be kept on file at Contractor's office at job site
 - b. Remaining copies for Contractor's office file, suppliers or subcontractors
 - c. Copies of submittal data in operation and maintenance manuals to be revised according to corrections
 - 4. Comply with corrections or comments as noted on the submittal or on a Submittal Response Summary Sheet
 - 5. Resubmission not required
- C. "Revise And Resubmit": Incorrect information provided or Significant Information Still Required
 - 1. One copy retained in Engineer's file
 - 2. All remaining copies returned to Contractor for revision and re-submittal
 - 3. Copy of transmittal letter and/or Submittal Response Summary Sheet sent to Owner. A "No Exceptions Taken" or "Exceptions Noted" submittal it will be forwarded to Owner after review per above disposition requirements
 - 4. Submittal is either: incorrectly annotated; specific comments need to be addressed and incorporated in re-submittal; and/or additional information may be required as noted on the submittal or on a Submittal Response Summary Sheet
 - 5. Submitted information may not include or address specific item required per the specification as identified on the submittal or on a Submittal Response Summary Sheet
 - 6. Specific information related to identified item may be required for final approval of submittal
 - 7. Resubmission of entire submittal may be required or resubmission of specific item may be required as identified on the submittal or on a Submittal Response Summary Sheet
- D. "Rejected": Returned for Correction
 - 1. One copy retained in Engineer's file
 - 2. All remaining copies returned to Contractor
 - 3. Copy of transmittal letter and/or Submittal Response sent to Owner
 - 4. Contractor required to resubmit complete submittal package in accordance with Contract Documents
 - 5. Submittal does not comply with provisions of Contract Documents as noted on the submittal or on a Submittal Response Summary Sheet
 - 6. Resubmission required
- E. "Receipt Acknowledged": For Reference Purposes Only, or for Record Copy:
 - 1. Applicable to manufacturer or Contractor provided calculations and other miscellaneous documentation no subject to Engineer review and approval
 - 2. One copy retained in Engineer's file
 - 3. One copy returned to Contractor
 - 4. Copy of transmittal letter sent to Owner
 - 5. Remaining submittal copies destroyed

6. Detailed review and comment by Engineer not required
7. Resubmission not required

1.7 DISPOSITION OF SAMPLES

- A. "No Exceptions Taken": Approved with No Corrections Noted
 1. One sample sent to Owner
 2. One sample retained in Engineer's file
 3. Acknowledgement: Copy of transmittal letter sent to Contractor
 4. Resubmission not required
- B. "Exceptions Noted": Approved with Corrections Noted
 1. One sample sent to Owner
 2. One sample retained in Engineer's file
 3. Acknowledgement: Copy of transmittal letter sent to Contractor
 4. Work performed or products furnished to comply with exceptions noted in acknowledgement
 5. Resubmission not required
- C. "Rejected": Returned for Correction
 1. One sample retained in Engineer's file
 2. Remaining samples sent to Contractor for resubmittal and compliance with the Contract Documents as noted in transmittal letter
 3. Copy of transmittal letter sent to Owner
 4. Resubmission required

1.8 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in submittals required by Engineer and resubmit until approved
- B. Transmit each resubmission under new letter of transmittal. Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., #001, #001A, #001B, etc.)
- C. Shop Drawings and Product Data
 1. Revise initial drawings or data and resubmit as specified for the initial submittal
 2. Indicate any changes which have been made other than those requested by Engineer
- D. Samples: Submit new samples as required for initial submittal
- E. Reimbursement of Resubmission Review Costs:
 1. Review of first submittal and one resubmittal will be performed by Engineer at no cost to Contractor
 2. Cost for review of subsequent resubmissions will be directly paid by Contractor
 3. Engineer will document work-hours required for review and costs for Engineer review will be deducted from payments due Contractor as Change Order deducts
 4. Charges for review of resubmissions will include Engineer at maximum rate of \$150 per hour and administrative staff at maximum rate of \$75 per hour

1.9 PROJECT RECORD SUBMITTALS

- A. After completion of the Work and prior to final payment, Contractor shall furnish record documents and final approved shop drawings and samples (as-constructed shop drawings and samples) in the number of copies specified herein.
 - 1. Contractor shall provide additional copies of final approved shop drawings and samples for insertion in Equipment instruction and O&M manuals as required
 - 2. All copies shall be clearly marked "Project Record"

1.10 ENGINEER'S DUTIES

- A. Review submittals with reasonable promptness and in accordance with approved submission schedule provided that each submittal has been called for by the Contract Documents and is stamped by Contractor as indicated above
 - 1. No extensions of time are allowed due to Engineer's delay in reviewing submittals unless all the following criteria are met:
 - a. Contractor has notified Engineer in writing that timely review of particular submittal in question is critical to the progress of the Work and Contractor has identified the requested submittal return date.
 - b. Engineer has failed to return submittal within 21 days of receipt of the submittal or receipt of said notice, whichever is later
 - c. Contractor demonstrates that delay in progress of the Work was directly attributable to Engineer's failure to return submittal within 21 days
 - 2. No extensions of time are allowed due to delays in progress of the Work caused by rejection and subsequent resubmission of data, including multiple resubmissions
 - 3. Engineer's review shall not extend to means, methods, techniques, sequences, construction operations, and safety precautions and programs incidental thereto. No information regarding these items will be reviewed whether or not included in submittals
 - 4. In the event that Engineer will require more than 21 calendar days to perform review, Engineer shall so notify Contractor
- B. Review drawings and data submitted only for general conformity with Contract Documents
 - 1. Engineer's review of drawings and data returned marked No Exceptions Taken or Exceptions Noted does not indicate a thorough review of all dimensions, quantities, and details of material, equipment device or items shown
 - 2. Engineer's review does not relieve Contractor of responsibility for errors, omissions or deviations nor responsibility for compliance with the Contract Documents
- C. Assume that no shop drawing or related submittal comprises a deviation to the Contract Documents unless Contractor advises Engineer otherwise in writing which is acknowledged by Engineer in writing:
 - 1. Consider and review only those deviations from the Contract Documents clearly identified as such on the submittal and tabulated on the Contractor's transmittal sheet.
- D. Review informational submittals for indications of Work or Material deficiencies and will respond to Contractor regarding such deficiencies

- E. Return submittals to Contractor for distribution or for resubmission
- F. Transmit, unreviewed, to Contractor all copies of submittals received directly from suppliers, manufacturers and subcontractors
- G. Transmit, unreviewed, to Contractor all copies of submittals not called for by the Contract Documents or which have not been approved by Contractor
- H. Engineer will not review uncalled-for shop drawings or product data except by special arrangement
- I. Affix stamp and indicate approval for submittal or resubmission requirements with the following stamp:

<input type="checkbox"/> NO EXCEPTIONS TAKEN <input type="checkbox"/> REVISE & RESUBMIT	<input type="checkbox"/> EXCEPTIONS NOTED <input type="checkbox"/> REJECTED
<p>This review was performed only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Modifications or comments made on the shop drawings and product data during this review do not relieve Contractor from responsibility for compliance with the requirements of the plans and specifications. Contractor is responsible for: dimensions and quantities; information that pertains solely to the fabrication processes or to the means, methods, of construction; coordination of the work of all trades.</p>	
<p>JVA, Inc.</p>	
<p>Date _____ By _____</p>	

1.11 SUBMITTAL SCHEDULE

- A. Unless indicated otherwise, provide all submittals required by individual sections of the Contract Documents to establish compliance with the specified requirements.
- B. Contractor to produce schedule of submittals for Engineer review

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Construction record photographs prior to commencing and during the course of the Work

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01700 – Contract Closeout

1.3 PHOTOGRAPHY REQUIRED

- A. Take photographs of the existing conditions prior to commencing work to document existing conditions
- B. Take photographs on the date on which each scheduled Application for Payment is due. Intent is for digital photos to be kept as project record
- C. CD of Digital photos become the property of Owner

1.4 COSTS OF PHOTOGRAPHY

- A. Pay all costs for specified photography and printing
 - 1. Parties requiring additional photography or prints will pay for them directly

1.5 DELIVERY OF PHOTOS

- A. Submit digital photos to the Engineer with monthly pay requests or within 20 days of photo date

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 TECHNIQUE

- A. Factual Presentation
- B. Correct Exposure and Focus
 - 1. High resolution and sharpness
 - 2. Maximum depth-of-field

3. Minimum distortion

3.2 VIEWS REQUIRED

- A. Photograph from locations to adequately illustrate the condition of construction and the state of the Project
 - 1. Photographic survey of the existing site
 - a. Show all areas to be modified
 - b. Show all areas in which Contractor will conduct operations or store equipment
 - 2. Weekly photographs
 - a. Minimum of eight (8) views weekly until final acceptance
 - b. Views as designated by the Engineer or Owner

3.3 PHOTOGRAPH REQUIREMENTS FOR PROGRESS SITE PHOTOGRAPHS

- A. Responsibility
 - 1. Site photographs for Owner record of construction progress shall be the responsibility of the Contractor
 - 2. Contractor shall be responsible for site photographs including the existing and progress of Work
- B. Photographs shall include, but not limited to, the following:
 - 1. Existing site: Photographs of existing site conditions before site work commences
 - a. Number of views shall be sufficient to cover the existing site conditions
 - 2. Progress of work: Shall include photographs from clearing throughout construction
 - a. Number of views shall be sufficient to cover progress in Work and shall include a minimum of eight (8) different views
 - 3. After completion of Work: Shall be sufficient to show completed and finished Work
- C. Digital images
 - 1. Provide images in uncompressed JPEG format
 - 2. Minimum resolution: 1500 x 2200
 - 3. Submitted digital images shall not be cropped
- D. Identify each digital image file
 - 1. Name of project
 - 2. Orientation and description of view
 - 3. Date and time of exposure

3.4 ADDITIONAL PHOTOGRAPHS

- A. Contractor shall provide additional photographs upon the request of the Engineer
- B. Additional photographs may include, but not limited to, the following:
 - 1. Publicity photographs
 - 2. Special events at Project site
 - 3. Major phase of Work
 - 4. Substantial Completion
 - 5. Follow-up investigations for on-site events such as construction damage or losses

6. Additional record photographs during final acceptance

3.5 PROJECT RECORD

- A. Submit CD of all photos, grouped by date
- B. Engineer will distribute, after review
 1. One copy of each view to Owner
 2. One copy of each view to Engineer's file
 3. One copy of each view returned to Contractor for inclusion in Project Record Document

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance/control of installation
- B. Inspection and testing laboratory services
- C. Qualification of laboratory
- D. Laboratory duties
- E. Limitations of authority of testing laboratory
- F. Contractor's responsibilities
- G. Field testing
- H. Testing and services schedule

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01340 – Shop Drawings, Product Data, and Samples
- C. Section 01600 – Material and Equipment

1.3 REFERENCES

- A. Conform to reference standard by date of issue current on date of Contract Documents
- B. Obtain copies of standards when required by Contract Documents
- C. Where specified reference standards conflict with Contract Documents, request clarification for Engineer before proceeding
- D. 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

1.4 SUBMITTALS

- A. Submit under provisions of Section 01340

- B. Provide copies of written reports for materials, equipment or systems as scheduled at the end of this section. Reference each report by respective section number.
- C. Laboratory Test Reports: Provide written reports of each test and inspection to Engineer. Each report shall include:
 - 1. Date issued
 - 2. Project title and number
 - 3. Testing laboratory name, address and telephone number
 - 4. Name and signature of laboratory inspector
 - 5. Date and time of sampling or inspection
 - 6. Record of temperature and weather conditions
 - 7. Date of test
 - 8. Identification of product and specification section
 - 9. Location of sample or test in the Project
 - 10. Type of inspection or test
 - 11. Results of tests and compliance with Contract Documents
 - 12. Interpretation of test results when requested by Engineer
- D. Shop Test Reports: Provide reports detailing results of tests and certification from manufacturer to verify compliance with specifications
- E. Field Test Reports: Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials and equipment which fails to pass field tests.

1.5 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality
- B. Comply fully with manufacturer's instructions, including each step in sequence
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding
- D. 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
- E. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement
- F. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract
- G. Certification of products: Respective sections of specifications
- H. Laboratory tests required and standards for testing: Respective sections of specifications

1.6 INSPECTION AND TESTING LABORATORY SERVICES

- A. Owner will employ and pay for the services of an independent testing laboratory to perform specified laboratory testing of materials where the technical specifications specifically obligate the Owner to provide the services
 - 1. Contractor shall cooperate with the laboratory to facilitate the execution of its required services
 - 2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract
 - 3. Contractor shall employ and pay for the services of an independent testing laboratory to perform all specified services and testing not specifically identified in the technical specifications to be provided by Owner related to the design of mixes, products and equipment, to Engineer's review of proposed materials and equipment before, during and after incorporation in the Work and to retest materials and equipment which fail original tests
- B. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for retesting will be charged to the Contractor by deducting inspection or testing charges from the Contract Sum/Price

1.7 QUALIFICATION OF LABORATORY

- A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories
- B. Meet basic requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" as applicable
- C. Authorized to operate in the State in which the Project is located

1.8 LABORATORY DUTIES

- A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice
- B. Perform specified inspections, sampling, and testing of materials and methods of construction
 - 1. Comply with specified standards
 - 2. Ascertain compliance of materials with requirements of Contract Documents
- C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products

1.9 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory Is Not Authorized To
 - 1. Release, revoke, alter or enlarge on requirements of Contract Documents

2. Approve or accept any portion of the Work
3. Owner employed laboratory shall not perform any duties of the Contractor

1.10 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory and testing personnel and provide access to Work
- B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing
- C. Provide to the laboratory the preliminary design mix proposed to be used for concrete and other material mixes which require control by the testing laboratory
- D. Furnish copies of product test reports as required
- E. Furnish Incidental Labor and Facilities
 1. To provide access to Work to be tested
 2. To obtain and handle samples at the project site or at the source of the product to be tested
 3. To facilitate inspections and tests
 4. For storage and curing of test samples
- F. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested
 1. Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services to allow for scheduling of tests and laboratory assignment of personnel
 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use

1.11 FIELD TESTING

- A. Owner shall pay all costs associated with standard field testing of materials as detailed in these specifications. Contractor shall pay all costs for testing of piping and equipment as detailed in these specifications. Owner's independent firm will take concrete samples, cure and break samples and report results. Owner's independent firm will also provide compaction testing and proctors for backfill operations. Contractor shall pay for all retesting due to tests indicating failed conditions.
- B. Provide all required materials, labor, equipment, water, and power required for testing
- C. Perform all tests in presence of Engineer and provide one copy of field test results to Engineer same day of tests
- D. Repair with no additional compensation all materials and equipment which fail during testing

- E. Field testing shall be provided for, but shall not be limited to, the following:

Specification Section	Type of Material, Equipment, or System	Owner (O) or Contractor (C) Provided
02300	Earthwork	C
02530	Sanitary Sewer Systems	C

1.12 TESTING AND SERVICES SCHEDULE

- A. Testing laboratory services shall be provided for, but shall not be limited to, the following:

Specification Section	Type of Material, Equipment, or System	Owner (O) or Contractor (C) Provided
02300	Earthwork	C
03400	Precast Concrete Structures	C

1.13 SHOP TESTING

- A. Shop testing shall be provided for the following:

Specification Section	Type of Material, Equipment, or System	Owner (O) or Contractor (C) Provided
11306	Duplex Submersible Pump Station	C

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heating, ventilating, water and sanitary facilities
- B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.
- C. Construction Staging Facilities: Access roads, parking areas, progress cleaning, project signage, and storage.

1.2 GENERAL REQUIREMENTS

- A. Furnish, install and maintain all temporary utilities to assure continuous service required for the Work, except as allowed herein, and remove on completion of Work. Modify and extend systems, as work progress requires
- B. Furnish, install and maintain all construction aids required for the Work, except as allowed herein, and remove on completion of the Work
- C. Furnish, install and maintain fences and barriers as required for protection of the public, property and the Work
- D. Contractor may use existing roadways for access and parking only where designated by Owner.
- E. Provide a field office for the use of the Contractor's Superintendent, Owner's Representatives, and Engineer in the designated staging area
- F. Products may be new or used, but must be serviceable, adequate for the intended purpose, and must not violate the requirements of any applicable codes or standards
- G. Clean and repair damage caused by temporary installations or use of temporary facilities. Grade and seed all disturbed areas not detailed on the drawings for other treatment
- H. Provide contractor information sign posted at accessible location with contractor name and emergency phone contact information. Provide and post necessary information related to SRLF requirements.

1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies

1. Comply with applicable Federal and State rules and regulations, local codes and ordinances
2. Comply with utility company requirements

1.4 TEMPORARY ELECTRICITY

- A. Contractor shall pay all costs associated with power service to the field offices and pay all costs for energy used. Electrical service is provided by Xcel Energy
- B. Arrange for and pay all costs associated with temporary power service either from the local utility or a portable engine-generator
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located at the site. Provide flexible power cords as required
- D. Provide main service disconnect and over current protection at convenient location
- E. Pay all costs for installation and removal of temporary electrical service
- F. Provide standby power conduit and cables for temporary use during construction. Completely remove temporary service after new permanent service is installed

1.5 TEMPORARY LIGHTING

- A. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes as required
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required
- C. Maintain lighting and provide routine repairs

1.6 TEMPORARY WATER SERVICE

- A. Potable water does exist on the site. Provide and pay for all temporary potable water piping and hoses to bring to Contractor's construction facilities and drinking water stations. Install a meter at a location approved by the Owner.
- B. Provide all drinking water required by construction personnel and Owner's representatives. Pay all costs for temporary water service.

1.7 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities at staging area and at location of work as required
 1. As required by laws and regulations
 2. Not less than 1 facility
- B. Service, clean and maintain facilities and enclosures

1.8 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work: scaffolds staging, ladders, stairs, ramps, runways, platforms, railways, hoists, cranes, chutes and other such facilities and equipment
- B. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements by Owner
- C. Completely remove temporary materials, equipment, and services at completion of the Project
- D. Clean and repair damage caused by installation or by use of temporary facilities
 - 1. Grade the areas for the site affected by temporary installations to required elevations and slopes and clean the area and seed unless specified as shown on the drawings to be different

1.9 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition
- B. Provide suitable barriers as required for public protection of Owner's employees
- C. Protect non-owned vehicular traffic, stored materials, site and structures from damage
- D. Install facilities of a neat and reasonable uniform appearance, structurally adequate for the required purposes
- E. Relocate barriers as required by progress of construction
- F. Completely remove barriers, when construction has progressed to the point that they are no longer needed
- G. Clean and repair damage caused by installation, fill and grade the areas of the site to required elevations and slopes and clean the area

1.10 TEMPORARY FENCING

- A. Construction: Commercial grade chain link fence
- B. Provide additional fencing to protect stored materials & products or to insure public safety and the safety of Owner's employees
- C. Provide Owner two (2) keys to lock(s)
- D. The site of the work is fenced

1.11 STORMWATER MANAGEMENT

- A. Refer to SWMP in the drawings and comply with all conditions of CDPHE Stormwater Discharge Permit. Contractor responsible for both permit filing and any required reporting.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment as necessary.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Perform work in phases and restore areas where work is complete.

1.12 FUGITIVE DUST PERMIT

- A. Comply with all conditions of CDPHE Fugitive Dust Permit. Contractor responsible for both permit filing and any required reporting.
- B. Contractor to pay for all metered water used in dust abatement

1.13 CONSTRUCTION DEWATERING

- A. Comply with all conditions and requirements of CDPHE Construction Dewatering Permit. The Contractor shall be responsible for any permit filing and reporting necessary.

1.14 EROSION AND SEDIMENT CONTROL

- A. Install sediment control fencing at site perimeter where necessary to prevent erosion and sedimentation from occurring off site.
- B. During and after site grading, maintain a roughened surface on all disturbed areas to minimize erosion potential.
- C. Construct and maintain drainage swales with staked straw bale barriers to control drainage patterns and minimize erosion.
- D. Provide and maintain gravel sediment traps at inlets to prevent siltation.
- E. Provide and maintain rock check dams if required.
- F. Soils can be stockpiled on site as directed by Owner. Rock to be hauled off not crushed and stockpiled onsite.

1.15 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. Protect finished driving surfaces, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects
- D. Prohibit construction traffic from entering future landscaped areas after grades have been established and topsoil restored

1.16 SECURITY

- A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft
- B. Coordinate with Owner's security program

1.17 ACCESS ROADS

- A. Maintain existing roads accessing public thoroughfares to construction staging area.
- B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow
- C. Provide and maintain access to existing fire hydrants free of obstructions
- D. Provide means of removing mud from vehicle wheels before entering public paved streets as required by SWMP and Owner

1.18 PARKING

- A. Paved and unpaved surfaces adjacent to the staging area can accommodate construction personnel until the designated staging area has been established
- B. If staging area space is not adequate, provide additional off-site parking at location designated by Owner

1.19 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition
- B. Remove waste materials, debris, and rubbish from site periodically and dispose off-site in accordance with local and state regulations. Due to high winds experienced at the site, waste removal must be done immediately after it is generated

1.20 FIELD OFFICES AND SHEDS

- A. Construction
 - 1. Structurally sound, weather-tight, with floors raised above ground

2. Temperature transmission resistance: Compatible with occupancy and storage requirements
3. At Contractor's option, portable or mobile buildings modified for office use may be used
4. Fill and grade sites for temporary structures to provide surface drainage
5. Construct temporary field offices and storage sheds on proper foundations, provide connections for utility services
 - a. Secure portable or mobile buildings for winds to 110 mph
 - b. Provide steps and landings at entrance door
6. Mount thermometer at convenient outside location, not in direct sunlight
7. Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment and services
8. Remove temporary field offices, contents, and service at a time they are no longer needed

B. Contractor's Office and Facilities

1. Size: As required for general use and to provide space for project progress meetings
2. Furnishings in meeting area
 - a. Conference table and chairs for at least 6 persons
 - b. Racks and files for project record documents in, or adjacent to, the meeting area
 - c. Engineer and Owner will have use of meeting area when on site. Meeting area: 200 square feet minimum, minimum dimension 8 feet
3. Other furnishings: Contractor's option
4. One 10-inch outdoor-type thermometer

C. Existing facilities at the site shall not be used for field offices or storage

D. Fire protection equipment. Contractor shall provide and maintain fire extinguishers and active fire hydrants where indicated, maintain fire lanes to hydrants, and provide other equipment as necessary for proper fire protection during construction. Such equipment shall be for fire protection only.

1.21 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated
- C. Clean and repair damage caused by installation or use of temporary work

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements governing Contractor's selection of products for use in Project and for Work including, but not limited to, the following:
 - 1. Definitions
 - 2. General Requirements for Materials and Equipment
 - 3. Environmental Conditions
 - 4. Submittals
 - 5. Quality Assurance and Qualifications
 - 6. System Responsibility
 - 7. Transportation and Shipment
 - 8. Delivery, Storage and Handling
 - 9. Maintenance Materials
 - 10. Warranty
 - 11. Equipment and Product Selection and Identification
 - 12. Examination, Installation, Adjusting and Cleaning

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01340 – Shop Drawings, Product Data, and Samples
- C. Section 01400 – Quality Control
- D. Section 01650 – Starting of Systems
- E. Section 01730 – Operation and Maintenance Data
- F. Section 03000 – Concrete
- G. Section 11360 – Duplex Submersible Grinder Pump Section

1.3 REFERENCES

- A. AFBMA Std 9-90 – Load Ratings and Fatigue Life for Ball Bearings
- B. AFBMA Std 11-90 – Load Ratings and Fatigue Life for Roller Bearings
- C. AGMA – American Gear Manufacturer Association
- D. ANSI B1.1-89 – Unified Screw Threads

- E. ANSI B 1.20. 1-83 – Pipe Threads, General Purpose (Inch)
- F. ANSI B16.1-89 – Cast Iron Pipe Flanges and Flanged Fittings, Class 125
- G. ANSI B18.2.1-81– Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Log Screws
- H. ANSI B18.2.2-87 –Square and Hex Nuts
- I. NSF/ANSI 60-2012 Drinking Water Treatment Chemicals – Health Effects
- J. NSF/ANSI 61-2012 Drinking Water System Components – Health Effects
- K. Hazardous (Classified) Locations: Conform to requirements of NFPA70 Articles 500 through 504

1.4 DEFINITIONS

- A. Definitions used in this specification section are not intended to change the meaning of other terms used in the Contract Documents, such as “specialties,” “systems,” “structure,” “finished,” “accessories,” and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry
- B. Products: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term “product” includes the terms “material”, “equipment”, “system”, and terms of similar intent
- C. Named products: Items identified by manufacturer’s product name, including make or model number or other designation, shown or listed in the manufacturer’s published product literature that is current as of date of Contract Documents
- D. Foreign products: Distinguished from “domestic products” are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens or, nor living within, the United States and its possessions are also considered to be foreign products
- E. Materials: Products substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form a part of the Work
- F. Equipment: Product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping
- G. Special tools, instruments, devices, or accessories: Any tools, instruments, devices or accessories required for repair, adjustment or maintenance of equipment which are designed especially for the equipment in question or which are not normally kept in stock by local tool suppliers
- H. Responsible manufacturer: Unless otherwise specified, responsible manufacturer shall be manufacturer of driven equipment. Agents, representatives or other entities who are not a

direct component of manufacturing corporation will not be acceptable as a substitute for manufacturer's corporation in meeting this requirement

1.5 GENERAL REQUIREMENTS

- A. The section applies to all equipment provided under this contract
- B. The requirements of detailed specifications take precedence over this section in the event of an apparent conflict
- C. Provide all new Equipment and Materials, except as specified or required by testing
- D. Equipment and Materials removed from existing structure: Do not use in completed Work except where specifically indicated or specified
- E. Contractor to coordinate equipment with other parts of the Work, including verification or compatibility of structures, piping, wiring and equipment components
- F. Contractor is responsible for all alterations in the Work to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Drawings or specifications:
 - 1. The arrangement of equipment shown on the Drawings is based upon information available to the Owner at the time of the design and is not intended to show exact dimensions unique to a specific manufacturer
 - 2. More than one manufacturer has been used for mechanical layout and design to accommodate all named manufacturers
 - 3. The drawings are, in part, diagrammatic, and some features of the illustrated equipment installation may require revision to meet actual equipment installation requirements as provided by the Contractor
 - 4. Structural supports, foundations, connected piping, valves and electrical conduit specified may have to be altered as coordinated by the Contractor during the submittal process to accommodate the actual equipment provided by the Contractor
 - 5. No additional payment will be made to the Contractor for such revisions and alterations
- G. Do not use any material or equipment for any purpose other than that for which is designed or specified
- H. Equipment lists presented in these specifications and as specified on the drawings are included for the convenience of the Engineer and Contractor and are not to be considered as complete listings of all equipment, devices and material to be provided under this contract:
 - 1. Contractor to prepare his own material and equipment take-off lists as necessary from the contract drawings, addenda and this project manual to meet the requirements of this project

1.6 ENVIRONMENTAL CONDITIONS

- A. Project is located at a wastewater treatment facility where dilute concentrations of corrosive or explosive chemicals, gasses, fuels, and others may be expected to be present
- B. Various corrosive or explosive mixtures of liquids including; solvents, grease, gasoline and other hazardous materials may be present
- C. Minimum Design Criteria (Larimer County, 2012 International Building Codes):
 - 1. Altitude: 4,990 feet above mean sea level
 - 2. Outdoor air temperature: -10 to 100 degrees F
 - 3. Relative Humidity:
 - a. Summer time: 100 percent
 - b. Winter time: 70 percent
 - 4. Design Flat Roof Snow Loading: 30 psf
 - 5. Wind speed: 108 mph, exp C
 - 6. Seismic Zone: B

1.7 SUBMITTALS

- A. Provide submittals in accordance with Section 01340
- B. Submittals for products are specified in Section 01340 and in Divisions 2 through 16
- C. All submittals for each component of multi-component systems shall be compiled and submitted through the Contractor to the Engineer by the manufacturer having System Responsibility
- D. Provide a copy of this specification section with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements.
- E. Provide Certificate of System Responsibility
- F. Manufacturer's certified data showing location of critical speeds in relation to operating speeds

1.8 QUALITY ASSURANCE AND QUALIFICATIONS

- A. Source limitations and interchangeability: To the fullest extent possible, provide products of the same kind from a single source
- B. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplate or trademarks on exposed surface of products that will be exposed to view in occupied spaces or on the exterior
 - 1. Labels: Locate required product labels and stamps on concealed surfaces, or where required for observation after installation, on inconspicuous, accessible surfaces.
 - 2. Equipment nameplates: Provide a permanent nameplate on each item of service – connected or power-operated equipment. Locate on an easily accessible surface that

is inconspicuous in occupied spaces. Nameplate shall contain, but not limited to, the following information and other essential operating data:

- a. Name of product and manufacturer
 - b. Model and serial number
 - c. Capacity
 - d. Speed
 - e. Ratings
 - f. Operating and power characteristics
 - g. Labels of tested compliance with codes and standards
3. Refer to additional requirements specified in Divisions 2 through 16

C. Installers Qualifications:

1. Equipment and material: Installed and placed in service by or under guidance of qualified personnel having knowledge and experience necessary for proper results
2. Where Contractor's or subcontractor's employees are not properly qualified, use personnel such as factory authorized field representative of equipment supplier

1.9 SYSTEM RESPONSIBILITY

- A. Equipment systems made up of two or more components shall be provided as a single system by the responsible manufacturer. Unless otherwise specified, the Contractor shall assign system responsibility to, and obtain each system from the manufacturer of the driven equipment. The manufacturer shall design and provide all components of the system to enhance proper operation, compatibility of all components, ease of construction and efficient maintenance. The responsible manufacturer shall coordinate selection and design of all system components such that all equipment is compatible and operates properly to achieve the performance requirements specified. The Contractor is responsible to the Owner for performance of all systems as provided in the General and Special Conditions.
- B. Nothing in this provision shall be construed as relieving the Contractor of overall responsibility for the Work of this Contract and the performance of all systems as specified under paragraphs 00700-Article 13

1.10 TRANSPORTATION AND SHIPMENT

- A. Shipment preparation: Contractor shall require manufacturers and suppliers to prepare Equipment and Materials for shipment in a manner to facilitate unloading and handling, and to protect against damage or unnecessary exposure in transit and storage, for contractor supplied equipment. Provisions for protection shall include the following:
 1. Crates or other suitable packaging materials
 2. Covers and other means to prevent corrosion, moisture damage, mechanical, injury, and accumulation of dirt in motors, electrical equipment, and machinery
 3. Suitable rust-preventive compound on exposed machined surfaces and unpainted iron and steel
 4. Grease packing or oil lubrication in all bearings and similar items

B. Marking

1. Each item of Equipment and Material shall be tagged or marked as identified in the delivery schedule or on submittals
2. Complete packing lists and bills of material shall be included with each shipment.
3. Each piece of every item need not be marked separately, provided that all pieces of each item are packed or bundled together and the packages or bundles are properly tagged or marked

1.11 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Arrange deliveries of Equipment and Materials in accordance with construction schedules, in ample time to facilitate inspection prior to installation and to avoid delay of Work. Coordinate to avoid conflict with work and conditions at the site
2. Deliver products in undamaged condition, in manufacturer's sealed, weather tight, original container or packaging, with identifying labels intact and legible, all in accordance with manufacturer's instructions and recommendations using means and methods that will prevent damage, deterioration, and loss, including theft
3. Control delivery schedules to minimize long-term storage at the Site and to prevent overcrowding of construction spaces. Coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss
4. Products delivered to Work site shall be in undamaged condition, in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing
5. Mark deliveries of component parts of equipment to identify the equipment, to permit easy accumulation of parts, and to facilitate inspection and measurement of quantity or counting of units
6. Immediately on delivery, inspect shipment to ensure:
 - a. Product complies with requirements of Contract Documents and reviewed Submittals
 - b. Quantities are correct
 - c. Containers and packages are intact and labels are legible
 - d. Equipment and Materials are properly protected and undamaged
7. Include complete packing lists and bills of material with each shipment including Equipment Identification number assigned by Drawings and Specifications of this Contract

B. Storage

1. There is no interior space available from the Owner for storage of delivered equipment and material at the project site:
 - a. Provide adequate facilities for storage in accordance with Section 01500
 - b. Provide off-site storage and protection when site does not permit on-site storage or protection and if acceptable to Owner in accordance with the General Conditions
2. Submit and maintain insurance for Equipment and Materials at off-site storage

3. Requests for payment of stored Equipment and Materials by the Contractor may be rejected if storage facilities do not conform to these specifications or manufacturer's written recommendations.
4. Store Equipment and Materials immediately on delivery, and protect until completion of the Work. Store in accordance with manufacturer's instructions with seals and labels intact and legible
5. Store Equipment and Materials in a manner that will not endanger the supporting construction
6. Store Equipment and Materials that are subject to damage by elements in weathertight enclosures
7. Maintain temperature and humidity within ranges required by manufacturer
8. Protect motors, electrical equipment, plumbing fixtures, and machinery of all kinds against corrosion, moisture deteriorations, mechanical injury, and accumulation of dirt or other foreign matter
9. Protect electrical equipment, controls, and insulation against moisture, water, and dust damage
10. Protect exposed-machined surfaces and unpainted iron and steel as necessary with suitable rust-preventive compounds
11. Protect bearings and similar items with grease packing or oil lubrication
12. Handle and store steel plate, sheet metal, and similar items in a manner to prevent deformation
13. Exterior storage:
 - a. Provide substantial platforms, blocking, or skids to support fabricated products aboveground and to prevent soiling or staining. Cover products subject to discoloration or deterioration from exposure to elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation
 - b. Store loose granular materials on solid surface areas to prevent mixing with foreign matter
 - c. Provide surface drainage to prevent flow or ponding of rainwater
14. Equipment and Materials shall not show any pitting, rust, decay or other deleterious effects of storage prior to final acceptance of Work
15. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to ensure products are maintained under specified conditions and free from damage or deterioration
 - a. Prepare stored materials lists with schedules of maintenance activities and frequency of activities required to maintain the quality of the equipment and the warranty from the manufacturer
 - b. List dates and activities of storage requirements such as rotating moveable parts
 - c. Update lists weekly and include in progress meeting agenda
16. Protect painted surfaces against impact, abrasion, discoloration or other damage:
 - a. Repaint any damaged areas with manufacturer provided touch-up paint
17. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation
18. Installed products stored prior to start-up:
 - a. Equipment and materials shall not show any pitting, rust, decay or other deleterious effects of storage when installed in the Work

- b. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations, dust, dirt, water and paint. Remove when no longer needed
- C. Handling
 - 1. Provide equipment and personnel necessary to unload and handle Equipment and Materials, by methods to prevent damage or soiling to Equipment and Materials or packaging
 - 2. Handle by methods to prevent bending or overstressing. Where lifting points are designated, lift components only at those points
 - 3. Provide additional protection to surrounding surfaces as necessary to prevent damage
- D. Maintenance of storage
 - 1. Inspect stored Equipment and Materials on a scheduled basis
 - 2. Verify that storage facilities comply with manufacturer's product storage requirements, including environmental conditions continually maintained
 - 3. Verify that surfaces of products exposed to elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents
 - 4. For mechanical and electrical equipment in long-term storage, provide manufacturers service instructions to accompany each item, with notice of enclosed instructions on exterior of package. Service Equipment on a regularly scheduled basis.
- E. Protection after installation
 - 1. Provide substantial coverings as necessary to protect installed Equipment and Materials from damage from subsequent construction operations
 - 2. Remove when no longer needed or as specified

1.12 MAINTENANCE MATERIALS

- A. Spare Parts:
 - 1. Store spare parts, wherever required by detailed technical specification sections, in accordance with the provisions of this paragraph
 - 2. Tag all spare parts with permanent, labeled tags or packaging by equipment designation number and identified as to part number, equipment manufacturer, and subassembly component (if appropriate)
 - 3. Spare parts subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping
 - 4. Unless otherwise specified, spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box:
 - a. Provide box with a hinged wooden cover and locking hasp
 - b. Hinges to be strap type
 - c. Paint the box and identify with stenciled lettering stating the name of the equipment, equipment numbers, and the words "spare parts"
 - 5. Prepare and provide a neatly typed inventory of spare parts taped to the underside of the box cover

1.13 WARRANTY

- A. Warranty all Equipment and Materials against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, leakage, breakage or other failure
- B. Unless otherwise specified, for all Equipment and Materials provide manufacturer's warranty for a period of 2 years from the date of Final Completion
- C. Warranties that begin at the time of shipment, delivery or within a limited time period from date of shipment or delivery or any other qualification that does not conform to the definition of Substantial Completion are not acceptable
- D. Cost of all manufacturer warranties are considered as part of the Bid price

PART 2 PRODUCTS

2.1 MATERIALS

- A. Suitable for the intended service conditions
- B. Miscellaneous fabricated steel in equipment shall conform to AISC standards, except as otherwise specified

2.2 FABRICATION

- A. Design, fabricate, and assemble in accordance with the best modern manufacturing and shop practices
- B. Manufacture parts to standard sizes and gages
- C. Two or more items of the same type shall be identical by the same manufacturer and interchangeable

2.3 EQUIPMENT AND PRODUCT SELECTION

- A. General product requirements: Provide products that comply with the Contract Document, are undamaged, and unless otherwise indicated or specified, are new at time of installation
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect
 - 2. Standard products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects
 - 3. Continued availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced product for which the manufacturer has published assurances that the product and its parts shall be available to the Owner at a later date. A reasonable

doubt regarding such future availability will be grounds for rejection of products other than named products

4. As specified in each applicable Specification Sections, Drawings, codes, standards, and regulatory agencies
5. Fabricated products:
 - a. Design, fabricate, and assemble products in accordance with best engineering and shop practices
 - b. Manufacture like parts of duplicate units to standard interchangeable sizes and gauges. Two or more items of same kind shall be identically made by the same manufacturer
 - c. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically accepted in writing by Owner
 - d. Ensure that material or equipment are not used for any purpose other than that for which it is designed or is specified
 - e. Labels and nameplates shall be provided where required by regulatory agencies or in accordance to state identification and essential operation data
6. Provide products of the same kind from a single source to the fullest extent possible

2.4 EQUIPMENT AND PRODUCT IDENTIFICATION

- A. Nametags: Identify all valves, instruments, devices, with the equipment tag designation numbers and prefix and suffix letters as specified.
- B. Nameplates: Identify all pumps and equipment with the equipment tag designation numbers and prefix and suffix letters as specified:
 1. Provide engraved or machine stamped non-corrosive metal nameplate fastened to the pump or equipment base plate with screws or drive pins of the same material
 2. Nameplate material shall not corrode or discolor in moist or salt water spray atmosphere
 3. Name plates indicate the following:
 - a. Manufacturer
 - b. Date of manufacture
 - c. Name of product
 - d. Model and size
 - e. Serial Number
 - f. Capacity: Rating in gpm and feet of head
 - g. Impeller diameter
 - h. Operating and power characteristics
 - i. As specified herein and in Divisions 2 through 16
 4. Motor Nameplates:
 - a. All motors for pumps and other equipment having motors shall be identified as specified elsewhere under this Section and in Divisions 2 through 16

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install any equipment showing such effects. Replace damaged equipment with identical new equipment

3.2 INSTALLATION

- A. Install all equipment, accessories and materials in accordance with the manufacturer's written recommendations unless otherwise specified in the individual equipment detailed technical specifications
- B. Each product shall be securely anchored in place except as required for proper movement and performance
- C. Each product shall be located and aligned with other Work
- D. Manufacturer's Instructions
 - 1. Contractor shall obtain and distribute hard copies and electronic copies of manufacturer's instructions and recommendations to parties involved in installation including a copy to Engineer
 - 2. Maintain one (1) set of complete instructions at job site during installation and until completion
 - 3. Handle, install, connect, clean, conditions, and adjust products in accordance with such instructions and in conformity with specified requirements

3.3 ADJUSTING

- A. Perform all required adjustment tests, operation checks, and other startup activities required

3.4 CLEANING

- A. Perform under provisions of Section 01700
- B. Repaint all painted surfaces which are damaged prior to final equipment acceptance to Owner's satisfaction
- C. Clean exposed surfaces and protect as necessary and required to prevent any damage or deterioration at the time of Substantial Completion

END OF SECTION

SECTION 01650
STARTING OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Starting systems
- B. Demonstration, instructions, and training
- C. Testing, adjusting, and balancing

1.2 RELATED SECTIONS

- A. Section 01730 - Operation and Maintenance Data

1.3 STARTING SYSTEMS

- A. Provide Engineer with start-up and training schedule at least 14 days prior to the startup of the equipment
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage
- C. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer
- D. Verify wiring and support components for the equipment are complete and tested
- E. Execute start-up under supervision of responsible manufacturer's representative in accordance with manufacturers' instructions
- F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and supervise placing equipment or system in operation
- G. Submit a written report certifying that equipment or system has been properly installed and is functioning correctly

1.4 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel within 7 days prior to date of Substantial Completion
- B. Utilize Operation and Maintenance Manuals as basis for instruction. Review contents of

manual with Owner's personnel in detail to explain all aspects of operation, maintenance, and troubleshooting

- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled times, at equipment location
- D. Prepare and insert additional data in Operations and Maintenance Manuals when need for additional data becomes apparent during instruction
- E. The amount of time required for instruction on each item of equipment and system is that specified in individual sections
- F. Owner may videotape training sessions. Contractor and manufacturer's trainer to cooperate with videotaping

1.5 TESTING, ADJUSTING, AND BALANCING

- A. Contractor will employ and pay for services of an independent firm to perform testing, adjusting, and balancing as required by individual specification sections or on the Drawings
- B. Reports will be submitted by an independent firm to the Engineer, through the Contractor, indicating observations and results of tests and indicating compliance or non-compliance with specified or regulatory requirements and with the requirements of the contract

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Substantial completion
- B. Final acceptance
- C. Project record documents
- D. Closeout procedures
- E. Final cleaning
- F. Final adjustment of accounts
- G. Final application for payment

1.2 RELATED SECTIONS

- A. Section 00700 – General Conditions
- B. Section 01500 – Construction Facilities and Temporary Controls
- C. Section 01340 – Shop Drawings and Product Data

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Prior to requesting inspection for certification of Substantial Completion, complete the following and list exceptions in the request:
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100% completion for the portion of the Work claimed as Substantially Complete
 - a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Price
 - b. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete Work, and reasons the Work is not complete. All items remaining outstanding on the Contractor's punch list shall include a projected date of completion and/or correction with an explanation of why such item is not presently completed
 - 2. Advise Owner of pending insurance changeover requirements
 - 3. Submit specific warranties, workmanship Bonds, maintenance agreements, final certifications, and similar documents

4. Obtain and submit releases enabling Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases
 5. Submit record drawings, instruction books and operating manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information
 6. Deliver tools, spare parts, extra stock, and similar items
 7. Make final changeover of permanent locks and transmit keys to Owner. Advise Owner's personnel of changeover in security provisions
 8. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes
- B. Inspection Procedures: On receipt of a request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements. Engineer will prepare the Certificate of Substantial Completion following inspection or advise Contractor of construction that must be completed or corrected before the certificate will be issued
1. Engineering will repeat inspection when requested and assured by Contractor that the Work is Substantially Complete.
 2. Results of the completed inspection will form the basis of requirements for final acceptance

1.4 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required
 2. Submit an updated final statement, accounting for final additional changes to the Contract Price
 3. Submit a certified copy of Engineer's final inspection list of items to be completed or corrected, endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by Engineer.
 4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the Date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work
 5. Submit consent of surety to final payment
 6. Submit evidence of final, continuing insurance coverage complying with insurance requirements
- B. Reinspection Procedure: Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to Engineer.
1. Upon completion of reinspection, Engineer will prepare a certificate of final acceptance. If the Work is incomplete, Engineer will advise Contractor of Work that

- is incomplete or of obligations that have not been fulfilled but are required for final acceptance
2. If necessary, reinspection will be repeated, but at the expense of the Contractor who will reimburse the Owner for these services by the Engineer

1.5 PROJECT RECORD DOCUMENTS

A. General

1. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours
2. Maintain on site, one set of the following record documents; record actual revisions to the Work:
 - a. Contract Drawings
 - b. Specifications
 - c. Addenda
 - d. Change Orders and other Modifications to the Contract
 - e. Reviewed shop drawings, product data, and samples
 - f. Field test reports
 - g. Construction photographs
3. Store Record Documents and samples separate from documents used for construction
 - a. Provide files and racks for storage of documents
 - b. Provide locked cabinet or secure storage space for samples

B. Record Drawings

1. Maintain a clean, undamaged set of Contract Drawings and Shop Drawings
2. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown
3. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings
4. Give particular attention to concealed elements that would be difficult to measure and record at a later date
 - a. Record information concurrently with construction progress
 - b. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Mark each document "Project Record" in neat, large, printed letters
 - c. Mark new information that is important to Owner but was not shown on Contract Drawings or Shop Drawings
 - d. Note related Change Order numbers where applicable
 - e. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set
 - f. Upon completion of the Work, submit record drawings to Engineer for Owner's records
5. Contract Drawings and approved Shop Drawings: Legibly mark each item to record actual construction, including:

- a. Measured depths of elements of foundation in relation to finish grade or first floor datum
 - b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvement
 - c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
 - d. Field changes of dimensions and details
 - e. Changes made by Addenda or Change Order(s), if any
 - f. Details not on original Contract Drawings
 - g. References to related Shop Drawings and Modifications
- C. Record Specifications: Maintain one complete copy of the Project Manual including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and Modifications issued in printed form during construction
 - 1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
 - 2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
 - 3. Note related record drawing information and product data.
 - 4. Upon completion of the Work, submit record Specifications to Engineer for Owner's records
- D. Record Product Data: Maintain one copy of each product data Submittal. Note related Change Orders and markup of record drawings and specifications.
 - 1. Mark record documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Site and from the manufacturer's installation instructions and recommendations.
 - 2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
 - 3. Upon completion of markup, submit complete set of record product data to Engineer for Owner's records
 - 4. Legibly mark and record at each Product section description of actual Products installed, including the following:
 - a. Manufacturer's name, product model, number, trade name and supplies
 - b. Product substitutions or alternates utilized
 - c. Changes made by Addenda, field order or change order
- E. Record Samples Submitted: Immediately prior to Substantial Completion, Contractor shall meet with Engineer and Owner's personnel at the Project Site to determine which Samples are to be transmitted to Owner for record purposes. Comply with Owner's instructions regarding packaging, identification, and delivery to Owner.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records, and place in good order. Identify miscellaneous records properly

and bind or file, ready for continued use and reference. Submit to Engineer for Owner's records

1. For electrical refer to Section 16900

G. Maintenance Manuals: Contractor shall organize operation and maintenance data as specified in Section 01730

H. Submit documents to Engineer with claim for final Application for Payment

I. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes

J. Make documents and samples available at all times for inspection by Engineer

K. Label each document "Project Record" in neat, large printed letters

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 CLOSEOUT PROCEDURES

A. General

1. Comply with requirements stated in the Owner's General Conditions of the Contract and in these specifications for administrative procedures in closing out the Work
2. 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 inspection
3. Provide submittals to Engineer/Owner that are required by governing or other authorities
4. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due

B. Operation and Maintenance Instructions: Arrange for each installer of Equipment that requires regular maintenance to meet with Owner's personnel at Project Site to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals
2. Record documents
3. Spare parts, materials and tools
4. Lubricants and fuels
5. Identification systems
6. Control sequences
7. Hazards, hazardous chemicals data sheets
8. Cleaning
9. Warranties and bonds

10. Maintenance agreements and similar continuing commitments

- C. As part of instruction for operating Equipment, demonstrate the following procedures:
 - 1. Startup
 - 2. Shutdown
 - 3. Emergency operations
 - 4. Noise and vibration adjustments
 - 5. Safety procedures
 - 6. Economy and efficiency adjustments
 - 7. Effective energy utilization

3.2 FINAL CLEANING

- A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
 - 1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion
 - a. Remove labels that are not permanent labels
 - b. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition
 - c. Wipe surfaces of mechanical and electrical Equipment. Remove excess lubrication and other substances
 - 2. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction
 - 3. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the Site and dispose of lawfully.
 - a. Where extra materials of value remaining after completion of associated Work become Owner's property. Dispose of these materials as directed by Owner

3.3 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Evidence of Payment and Release of Liens: As specified in the General Conditions
- B. Final inspection reports by all regulatory agencies demonstrating the agencies' final approval
- C. At Contract close-out, deliver Record Documents to Engineer for the Owner
- D. Accompany Submittal with Transmittal Letter in Duplicate, Containing
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each Record Document
 - 5. Signature of Contractor or his authorized representative

3.4 FINAL ADJUSTMENTS OF ACCOUNTS

- A. Submit a Final Statement of Accounting to Engineer
- B. Statement Shall Reflect All Adjustments to the Contract Sum
 - 1. The original Contract Sum
 - 2. Additions and deductions resulting from
 - a. Previous Change Orders
 - b. Deductions for uncorrected Work
 - c. Deductions for liquidated damages
 - d. Deductions for reinspection payments
 - e. Other adjustments
 - 3. Total Contract Sum, as adjusted
 - 4. Previous payments
 - 5. Sum remaining due

3.5 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the General Conditions of the Contract

END OF SECTION

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittals
- B. Format
- C. Content of each volume
- D. Manual for equipment and systems
- E. Instruction of Owner's personnel

1.2 QUALITY ASSURANCE

- A. Preparation of data shall be done by personnel
 - 1. Trained and experienced in maintenance and operation of the described products
 - 2. Completely familiar with requirements of this section
 - 3. Skilled as a technical writer to the extent required to communicate essential data
 - 4. Skilled as a draftsman competent to prepare required drawings
- B. Manuals for equipment systems shall be prepared by the equipment manufacturer or system supplier
- C. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract
- D. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications

1.3 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Manuals for equipment and systems
 - 1. Engineer review
 - a. If acceptable, electronic copy will be returned to Contractor and electronic copy retained in Engineer's file
 - b. If unacceptable, an electronic copy will be returned to Contractor with Engineer's comments for revision and a copy retained in Engineer's file. Resubmit revised preliminary copy for Engineer's review

- c. No partial payments will be made for equipment and systems on hand or installed until preliminary manuals are submitted and acceptable
 - 2. Submit two (2) final copies no less than 30 days prior to putting the equipment or system in service. Submit ONE final copy in electronic format, on CD, for use by operations staff. If final manuals differ from accepted preliminary manuals, submit 2 copies of any necessary supplemental material with instructions for insertion for conforming engineer's copies of preliminary manuals to final manuals
 - a. Engineer will compare with accepted preliminary manual
 - b. If identical or otherwise acceptable, Contractor will be so notified. One copy will be transmitted to Contractor, one hard copy and the electronic copy will be held for later transmittal to Owner
 - c. If not acceptable, one hard copy and the electronic copy will be returned to Contractor for revision or retained by Engineer and the necessary revision data requested from Contractor at Engineer's option
 - d. No portion of the Work is substantially complete until final equipment and system manuals relating to that portion of the Work are accepted by Engineer
 - e. Submit 3 copies, including electronic copy, of any revisions found desirable during instruction of Owner's personnel with instructions for insertion for revising Owner's and Engineer's copies of manual
- C. Submit 3 final copies no less than 30 days prior to putting the equipment or system in service. If final manuals differ from accepted preliminary manuals, submit 2 copies of any necessary supplemental material with instructions for insertion for conforming Engineer's and Owner's copies of preliminary manuals to final manuals
 - 1. Engineer will compare with accepted preliminary manual
 - 2. If identical or otherwise acceptable, Contractor will be so notified. Two copies will be transmitted to Contractor, 3 copies will be held for later transmittal to Owner
 - 3. If not acceptable, 4 copies will be returned to Contractor for revision or retained by Engineer and the necessary revision data requested from Contractor at Engineer's option
 - 4. No portion of the Work is substantially complete until final equipment and system manuals relating to that portion of the Work are accepted by Engineer
 - 5. Submit 3 copies of any revisions found desirable during instruction of Owner's personnel with instructions for insertion for revising Owner's and Engineer's copies of manual
- D. Manual for materials and finishes
 - 1. Submit preliminary copies in electronic format 15 days prior to request for final inspection
 - a. Engineer will review
 - b. Electronic copy will be returned to Contractor with comments, one copy retained in Engineer's file
 - c. No final inspection shall be conducted until preliminary manuals are submitted
 - 2. Submit final electronic format copy, revised in accordance with Engineer's comments, within 10 days after final inspection
 - a. One copy will be transmitted to Contractor and one copy retained by Engineer for later transmittal to Owner

- b. No final payment shall be made until final manuals are submitted

1.4 FORMAT

- A. Prepare data in the form of an instructional manual for use by Owner's personnel
- B. Presentation of Information – electronic copies
 - 1. Adobe PDF format with index
 - 2. Provide dividers/fly sheets for each separate product or each piece of operating equipment
- C. Presentation of Information – hard copies
 - 1. Size: 8 ½" by 11"
 - 2. Paper: 20 lb weight minimum, white, for typed pages
 - 3. Text: Manufacturer's printed data or neatly typewritten
 - 4. Drawings
 - a. Provide reinforced punched binder tab, bind in with text
 - b. Reduced to 11" by 17" and folded to 8 ½" by 11"
 - c. Where reduction is impractical, folded and placed in 8 ½" by 11" envelopes bound in text
 - d. Suitably identified on drawings and envelopes
 - 5. Provide flysheets for each separate product or each piece of operating equipment
 - a. Provide typed description of product and major component parts of equipment
 - b. Provide indexed tabs, may be in color
 - 6. Spine and cover: identify each volume with typed or printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" preceded by the word. "PRELIMINARY" or "FINAL" as applicable. Final manuals to list information on the cover and the spine. List the following:
 - a. Title of project, reference Owner and project location as applicable
 - b. Identity of separate structure as applicable
 - c. Identity of general subject matter covered in manual and specification section number
 - 7. As much as possible, assemble and bind material in the same order as specified
- D. Binders
 - 1. Final manuals: Commercial quality permanent 3-ring or 3 post binders with durable, cleanable, hard plastic covers with clear plastic cover and spine pockets suitable for title and cover inserts. Manufacturer's pre-printed binder may be accepted upon review by Engineer. "Deluxe Round Ring View Binder" as manufactured by Wilson Jones or accepted substitution
 - 2. Final electronic manual: Provide one copy in digital format, all documents to be in native file format (Word, Excel, AutoCAD, pdf) or converted from native file format into Adobe pdf. Provide one copy on an electronic disk, CD or DVD
- E. Arrange content by systems under section numbers and sequence of table of contents of this Project Manual

- F. Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment
- G. Electronic Manual: Compile in an electronic book format with Chapter bookmarks (equal to tabbed fly leafs) and OCR (optical character recognition) to allow for document searches

1.5 CONTENTS OF EACH VOLUME

- A. Neatly typewritten table of contents for each volume, arranged in a systematic order
 - 1. Contractor, name of responsible principal, address and telephone number
 - 2. A list of each product required to be included, indexed to the content of the volume
 - 3. List, with each product, the name, address and telephone number of
 - a. Subcontractor or installer
 - b. Maintenance contractor, as appropriate
 - c. Identify the area of responsibility of each
 - d. Local source of supply for parts and replacement
 - 4. Identify each product by product name and other identifying symbols as set forth in Contract Documents
- B. Product Data
 - 1. Include only those sheets which are pertinent to the specific product
 - 2. Annotate each sheet to
 - a. Clearly identify the specific product of part installed
 - b. Clearly identify the data applicable to the installation
 - c. Delete references to inapplicable information
- C. Drawings
 - 1. Supplement product data with drawings as necessary to clearly illustrate
 - a. Relations of component parts of equipment and systems
 - b. Control and flow diagrams
 - 2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation
 - 3. Do not use Project Record Documents as maintenance drawings
- D. Written text, as required to supplement product data for the particular installation
 - 1. Organize in a consistent format under separate headings for different procedures
 - 2. Provide a logical sequence of instructions for each procedures
- E. Copy of each warranty, bond and service contract issued
 - 1. Provide information sheet for Owner's personnel, give
 - a. Proper procedures in the event of fracture
 - b. Instances which might affect the validity of warranties or bonds

1.6 MANUALS FOR EQUIPMENT AND SYSTEMS

- A. Provide an operation and maintenance manual for each item of equipment or system listed in the schedule of manuals in the quantity listed in the submittal schedule
- B. Content for each of equipment and system as appropriate
 - 1. Description of unit and component parts
 - a. Function, normal operating characteristics and limiting conditions
 - b. Performance curves, engineering data and tests
 - c. Complete nomenclature and commercial number of all replaceable parts
 - 2. Operating procedures
 - a. Startup, break-in, routine and normal operating instructions
 - b. Regulation, control, stopping, shutdown and emergency instructions
 - c. Summer and winter operating instructions, as applicable
 - d. Special operating instructions
 - 3. Maintenance procedures
 - a. Routine operations
 - b. Guide to "trouble-shooting"
 - c. Disassembly, repair and reassembly
 - d. Alignment, adjusting and checking
 - 4. Servicing and lubrication schedule
 - a. List of lubricants required
 - 5. Manufacturer's printed operating and maintenance instructions
 - 6. Description of sequence of operation by control manufacturer
 - 7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance
 - a. Predicted life of parts subject to wear
 - b. Items recommended to be stocked as spare parts
 - 8. As-installed control diagrams by controls manufacturer
 - 9. Each contractor's coordination drawings
 - a. As-installed color coded piping diagrams
 - 10. Charts of valve tag numbers with the location and function of each valve
 - 11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage
 - 12. Other data as required under pertinent sections of specifications
- C. Content for each electric and electronic item or system, as appropriate
 - 1. Description of system and component parts
 - a. Function, normal operating characteristics and limiting conditions
 - b. Performance curves, engineering data and tests
 - c. Complete nomenclature and commercial number of replaceable parts
 - 2. Circuit directories of panelboards
 - a. Electrical service
 - b. Controls
 - c. Communications
 - 3. As-installed color coded wiring diagrams

4. Operating procedures
 - a. Routine and normal operating instructions
 - b. Sequences required
 - c. Special operating instructions
5. Maintenance procedures
 - a. Routine operations
 - b. Guide to "trouble-shooting"
 - c. Adjustment and checking
6. Manufacturer's printed operating and maintenance instructions
7. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage
8. Other data as required under pertinent sections of specifications

- D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel
- E. Additional requirements for Operation and Maintenance Data: The respective sections of specifications

1.7 INSTRUCTIONS OF OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and system
- B. Operation and maintenance manual constitutes the basis of instruction
 1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance

1.8 Additional requirements for specialized instruction of Owner's personnel are given in the detailed equipment specifications

- A. Equipment and systems Operation and Maintenance manuals shall be prepared for each of the following

<u>Specification Section</u>	<u>Type of Equipment or System</u>
11306	Duplex Submersible Pump Station
16250	Generator
16280	ATS
16900	Control System

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 02053

POND CLEANING AND BIOSOLIDS DISPOSAL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Biosolids removal and disposal from the existing wastewater treatment facility
- B. Biosolids Removal and Disposal Affidavit
- C. Contractor and sludge removal and disposal subcontractor(s) are required to do the following:
 - 1. Inspect all areas where sludge removal is required,
 - 2. Field verify all access and equipment needs,
 - 3. Comply with all applicable regulations pertaining to the handling and disposal of biosolids materials, including but not limited to:
 - a. Colorado Department of Public Health and Environment (CDPHE)
 - b. Colorado Department of Transportation (CDOT)
 - c. United States Environmental Protection Agency (USEPA)
 - 4. Provide detailed and accurate written records of actual quantities of material removed
 - 5. Protect, preserve and restore areas around lagoons as shown on grading plan

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 02300 – Earthwork

1.3 QUALITY ASSURANCE

- A. Biosolids removal and disposal subcontractors shall be:
 - 1. Experienced in sludge cleaning and removal operations of this type with minimum 5 years of documented experience in Colorado with similar projects
 - 2. Parker Ag Services, LLC (719) 775-9870
 - 3. Liquid Waste Management, Inc. (303) 651-0309
- B. Biosolids Removal and Disposal Affidavit
 - 1. Contractor and sludge removal and disposal subcontractor(s) are required to sign attached Affidavit and attach it to the Bid Form
 - 2. By signing the Affidavit, Contractor certifies that he has received a lump sum bid from a sludge removal and disposal subcontractor
 - 3. By signing the Affidavit, the sludge removal and disposal subcontractor certifies that he has conducted all necessary investigations and testing required including the tasks required in Section 1.1 C to submit a lump sum bid to the Contractor for removal and

- disposal of all waste sludge/grit, regardless of volume, solids concentration or chemical composition
4. Upon receipt of executed Affidavit, Owner shall reimburse the sludge removal and disposal subcontractor(s), the direct costs for all necessary investigations and testing required to submit a lump sum bid to the Contractor up to \$2,000.00 per sludge removal and disposal subcontractor

1.4 SUBMITTALS

- A. Submit under provisions of 01340
- B. Submit "Letter of Intent for Use and Distribution of Biosolids" to the Colorado Department of Public Health and Environment (CDPHE) for quantity and quality of materials being disposed with an electronic copy submitted to Engineer.
- C. Include necessary testing of sludge
- D. Submit management plan and schedule to Engineer prior to submission to CDPHE, including:
 1. A detailed description and plan and layout of proposed equipment to be used on site
 2. Identification and description of contractors proposed method of removal and disposal

1.5 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Actual sludge volume, solids concentration and chemical composition to be determined by sludge removal and disposal contractor prior to the bid
- B. Descriptive information, for the sole purpose of familiarizing the contractor and subcontractor(s) with the wastewater lagoons and the anticipated biosolids characterization are included below. These data are estimates only and are provided for the convenience of the contractor as pre-bid information. Bid prices, measurement and payment shall not rely on this data.

Parameter	Cell 1	Cell 2	Rock Filter
Lagoon floor area	3,500 ft ²	2,500 ft ²	522 ft ²
Lagoon side slope	3:1	3:1	3:1
Aeration	Yes	Yes	No
Approximate sludge depth	1 foot	1 foot	1 foot
Approximate sludge volume, in situ	3,500 ft ³	2,500 ft ³	522 ft ³
Estimated solids concentration, in situ	10%	10%	10%

1.6 REGULATORY REQUIREMENTS

- A. Follow all requirements of State of Colorado Department of Public Health and Environment "Biosolids Regulation" for land application of biosolids on reclamation sites, including the filing of a "Letter of Intent for Use and Distribution of Biosolids":
 1. Obtain additional samples and test sludge as required

2. Submit certification and proof of compliance with all applicable Colorado Department of Health rules and regulations, including soil sampling and self-monitoring report
- B. Follow all requirements of the CDPHE for landfill disposal of sludge/grit that does not meet definition of "biosolids"

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Pond cleaning and biosolids disposal shall not begin until new lift station and force main are operating and demolition of the existing wastewater treatment facility is complete
- B. Land application of biosolids onsite at the existing wastewater lagoon site is not permitted
- C. Contractor may land apply sludge/grit offsite in accordance with the approved Sludge Management Plan and conditions of CDPHE authorization.
 1. Owner is not responsible for providing, suggesting, arranging or ensuring site for land application of biosolids.
 2. Determination and arrangements for land application site and/or landfill is the sole responsibility of the Contractor and subcontractor(s)
- D. All waste sludge/grit not classified as biosolids, is to be disposed of properly off-site at a CDPHE approved landfill.
- E. Subcontractor shall include all costs for transportation and disposal at land application site and/or landfill, including landfill tipping fee in the lump sum bid

3.2 OPERATIONS

- A. Biosolids removal and disposal:
 1. The biosolids removal and disposal subcontractor assumes all responsibility for means and methods required for removal and disposal of all biosolids, sludge and grit regardless of volume, solids concentration, or chemical composition
 2. All work is pursuant to all applicable terms and conditions of the Colorado Department of Public Health and Environment "Notice of Authorization for Use and Distribution of Biosolids" for this application

BIOSOLIDS REMOVAL AND DISPOSAL AFFIDAVIT

The undersigned Contractor, having familiarized himself with the Work required by Section 02053 has received a legitimate lump sum price from the undersigned biosolids removal and disposal subcontractor to remove and dispose of biosolids as defined in the Contract Documents.

The undersigned sludge/grit removal and disposal subcontractor having familiarized himself with the Work required by Section 02053, and the Drawings, has conducted all necessary investigations and has performed all necessary tests required to submit a lump sum price to the Bidder. The sludge/grit removal and disposal sub-contractor further certifies that the lump sum price includes the removal and disposal of all waste sludge/grit as defined in the contract documents regardless of quantity, chemical composition or solids concentration. Upon submission of this affidavit with the Bid of the Contractor, the Owner will directly reimburse the biosolids removal and disposal sub-contractors, direct costs associated with performing all necessary investigations up to a maximum value of \$2,000.00.

In order for Owner to process reimbursement, this affidavit must be included with the Bid Form and submitted with the Bid at the time of the Bid.

SIGNATURE OF CONTRACTOR

Signed By:

Date:

(Name)

(Title)

SIGNATURE OF BIOSOLIDS REMOVAL AND DISPOSAL SUBCONTRACTOR

Signed By:

Date:

(Name)

(Title)

END OF SECTION

SECTION 02220

DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Demolition, removal, abandonment, and disposal of existing structures, pipes and materials as indicated on the drawings.

1.2 RELATED SECTIONS

- A. Section 01500 – Construction Facilities and Temporary Controls
- B. Section 02053 – Pond Cleaning and Biosolids Disposal
- C. Section 02300 – Earthwork
- D. Section 02950 – Seeding

1.3 SUBMITTALS

- A. Permits and Certificates
 - 1. Certificates of severance of utility service
 - 2. Permit for transport and disposal of debris

1.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division One specifications
- B. Accurately record actual locations of capped utilities and subsurface obstructions

1.5 REGULATORY REQUIREMENTS

- 1.6 Conform to applicable State and local codes for demolition of structures, safety of adjacent structures, dust control, and disposal
 - A. Obtain required permits from authorities
 - B. Notify affected utility companies before starting work and comply with their requirements
 - C. Do not close or obstruct roadways, sidewalks, or hydrants without written permission from Owner
 - D. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials

1.7 SCHEDULING

- A. Schedule and submit under provisions of Division One specifications
- B. Demolition work on wastewater treatment plant facilities is not to begin until the new lift station and force main are in service

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Fill Material: Use on site fill material under provisions of Section 02300

PART 3 EXECUTION

3.1 INSPECTION

- A. Do not commence work until pre-demolition meeting has been held and conditions are acceptable to Engineer

3.2 PREPARATION

- A. Provide, erect, and maintain temporary barriers, enclosures, security fences and shoring at demolition locations in accordance with Division One and other related specifications to protect personnel
- B. Protect existing structures and utilities which are not to be demolished
- C. Provide temporary wiring and connections to maintain existing telephone, electrical, instrumentation and control systems in service during construction
- D. Mark location of existing utilities

3.3 GENERAL REQUIREMENTS

- A. Sprinkle Work with water to minimize dust where applicable. Provide hoses and water connections for this purpose
 - 1. Do not use water to extent causing flooding, contaminated runoff, or icing
- B. Backfill in accordance with Section 02300
- C. Repair damage to adjacent structures
- D. Remove demolished material from the site
- E. Leave site in clean condition after demolition activities

3.4 REMOVAL, DISPOSAL AND ABANDONMENT OF EXISTING FACILITIES

A. General

1. All remaining pipe penetrations left after removal of piping shall be plugged with a water tight concrete plug on a blind flange
2. Items designated for reuse or salvage by the Owner include
 - a. Existing lift station submersible solids handling pumps (two)
 - b. Sodium hypochlorite chemical metering pumps (two)
 - c. Tablet dechlorination equipment
3. All demolished piping, equipment, and building materials will be disposed off site unless specifically indicated to be reused or salvaged
4. See Section 01010 for Work Sequence

B. Aeration Cells

1. Remove floating surface aerators in each aeration cell with mooring cables and caisson
2. Remove all aeration cell piping in conflict with the proposed work, abandon the rest in place
3. Remove concrete discharge apron into aeration cells after cells have been cleaned

C. Effluent Flow Meter

1. Remove existing effluent flume and level sensor from chamber
2. Remove above grade conduit servicing existing flow meter
3. Remove concrete chamber housing effluent flow equipment

D. Chlorine Building

1. Remove existing electrical panels out the exterior of chlorine room
2. Remove exhaust fan and ducting
3. Remove chlorine feed equipment and ultrasonic level transmitter housed in the chlorine building
4. Remove chlorination building and re-grade as indicated on the drawings

E. Chlorination Chamber

1. Remove chlorination chamber and re-grade as indicated on the drawings.

F. Dechlorination

1. Remove dechlorination equipment chamber and save to owner
2. Remove dechlorination chamber and re-grade as indicated on the drawings

G. Discharge

1. Remove existing discharge pipe where indicated on the drawings
2. Cap and abandon remainder of discharge piping where indicated on the drawings and abandon in place

H. Lift Station Control Building

1. Remove existing electrical equipment within building as indicated on drawings

- I. Valve Vault
 - 1. Remove existing piping and valves within existing valve vault
 - 2. Remove existing concrete valve vault and re-grade as indicated on the drawings.

3.5 ELECTRICAL DEMOLITION

- A. General:
 - 1. Remove, relocate and extend existing installation to accommodate new construction
 - 2. Provide standby power conduit and cables for temporary use during construction.
Completely remove temporary service after new permanent service is installed
- B. Existing electrical service:
 - 1. Abandon single phase electrical service to chlorine building, aerator control equipment, lift station, and existing lift station building

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, and Division One and other related specification sections apply to work of this section.

1.2 SECTION INCLUDES

- A. Site Preparation
 - 1. Clearing and Grubbing
 - 2. Tree Protection
 - 3. Topsoil Stripping
 - 4. Waste and Debris
- B. Protection of Existing Utilities and Structures
- C. Excavation
 - 1. Dewatering
 - 2. Borrow, Spoils, and Stockpiles
 - 3. Excess and Waste Materials
 - 4. Excavation for Structures
 - 5. Trench Excavation
 - 6. Pavement Overexcavation
- D. Sheet piling, Shoring, and Bracing
- E. Subgrade Preparation
- F. Fill and Backfill
 - 1. Structural Backfill
 - 2. Structural Fill
 - 3. Trench Backfill
- G. Fill and Embankment
- H. Pipe Embedment
- I. Compaction
- J. Drainage Maintenance
- K. Site Grading
- L. Slope and Channel Stabilization

M. Settlement

N. Field Quality Control

1.3 RELATED SECTIONS

A. Section 02053 – Pond Cleaning and Biosolids Disposal

B. Section 02220 – Demolition

C. Section 02950 – Seeding

D. Section 03400 – Precast Concrete Structures

1.4 REFERENCES

A. American Society for Testing and Materials – ASTM:

1. C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
2. D698 – Standard Test Methods for Laboratory Compaction Characteristics of Solid Using Standard Effort
3. D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil
4. D2167 – Test Method for Density and Unit Weight of Soil In-Place by Rubber Balloon Method
5. D2216 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
6. D2487 – Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
7. D4253 – Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using Vibratory Table
8. D4254 – Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
9. D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
10. D4546 – Test Methods for One-Dimensional Swell/Settlement Potential of Cohesive Soils
11. D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

B. Occupational Safety and Health Administration – OSHA:

1. Part 1926 – Safety and Health Regulations for Construction

1.5 SUBMITTALS

A. Submit under provisions of Division One specifications.

B. Product Data: Submit on all products or materials supplied herein

- C. Test Reports: Indicate supplier, sieve analysis, optimum moisture content and density in accordance with ASTM D698 if appropriate for crushed rock or gravel, pipe embedment and material for fills and embankment
- D. When excavation, trenching, and shoring in compliance with local, state, or federal safety regulations such as OSHA Part 1926 or successor regulations, require design by a registered professional engineer, submit copies of design calculations and notes for sloping, benching, support systems, shield systems, and other protective systems prepared by or under the supervision of a professional engineer legally authorized to practice in Larimer County

1.6 REGULATORY REQUIREMENTS

- A. Burning will not be allowed on-site.
- B. Comply with all codes, regulations, and laws.
- C. Obtain and comply with all requirements of Larimer County and CDPHE Stormwater Discharge and/or Construction Dewatering Permits, as required.
- D. Excavation work shall be performed in compliance with Larimer County and current OSHA requirements

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Protect work from erosion or other similar types of damage until the project has been completed.
- B. Do not remove trees from outside excavation or fill areas unless authorized by the Owner; protect from permanent damage by construction activities

1.8 QUALITY ASSURANCE

- A. All imported material to be free of hazardous and organic wastes, “clean” as defined by EPA, and approved for its intended use by the Owner or project geotechnical engineer
- B. Obtain and comply with all requirements Town of Berthoud, Larimer County, and CDPHE Stormwater and/or Groundwater Discharge Permits, as required.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Soil materials, whether from sources on or off the site, must be approved by the Geotechnical Engineer as suitable for intended use and specifically for required location or purpose.
- B. Classification of Excavated Materials:

1. No classification applied: Remove and handle all excavated materials regardless of its type, character, composition, condition, or depth.
2. Transport and properly dispose of any rubble and waste materials found in excavation off the Owner's property

C. Fills

1. Fill material must be acceptable to Engineer
2. To the maximum extent practical use excess earth from onsite excavation for fills Free from rocks or stones larger than 6 inches in greatest dimension and free from brush, stumps, logs, roots, debris, and organic and other deleterious materials
3. No rocks or stones larger than 3 inch in upper 18 inches of fill. Where allowed, distribute rocks and stones through the fill to not interfere with compaction.

D. Imported Fill for Fills:

1. The Contractor is responsible for obtaining additional material for fills and embankments as necessary to meet the requirements shown on Drawings
2. Import fill as specified in the geotechnical report:
 - a. No. 200 Sieve: less than 60% passing
 - b. Plasticity index: less than 15%

E. Structural Fill

1. Imported structural fill, such as a minus ½-inch CDOT Class 7 Aggregate Road Base, conforming to the following:
 - a. Gradation: 1": 100% passing (percent finer by weight ASTM C136), No. 8 Sieve: 20-85% passing, and No. 200 Sieve – 5-15% (max)
 - b. Liquid Limit: 30 (max), Plasticity Index: 6(max), R- Value: 50 (min)

F. Topsoil

1. Topsoil is defined as fertile natural loan surface soil. Reasonably free of subsoil, clay lumps, brush, weeds, other litter, rocks, stumps, stones larger than 2", and other extraneous or toxic mater harmful to plant growth for areas to be seeded or planted.
2. Reuse grubblings and surface topsoil containing plants and seeds in designated revegetation areas only.

G. Pipe Embedment: Graded gravel

1. ¾" – 1": Crushed rock

Sieve Size (Inches)	Percent Passing by Weight
1	100
¾	90-100
½	25-60
⅜	20-55
No. 4	0-10
No. 8	0-5
No. 200	0-2

H. Drain gravel

1. Crushed rock, granular material with a maximum size of 1-1/2"

2. Minimum 50 percent passing No. 4 sieve; maximum 5 percent retained on No. 200 sieve
- I. Compacted Trench Backfill
 1. Job excavated material finely divided, free of debris, organic material, and stones larger than 3 inch in greatest dimension without masses of moist, stiff clay, or topsoil
 - J. Trench Cover
 1. Free of brush, debris and roots
 2. In upper 18 inch no rock or rock excavated detritus, larger than 6 inch except with specific approval of Engineer
 3. No stones larger than 6 inch in greatest dimension within 3 feet of top of pipe
 - K. Road Base
 1. Shall meet ASTM specification for Class II aggregate base and CDOT Class 6 gradation

Sieve Size (Inches)	Percent Passing by Weight
1	100
3/4	900-100
No. 4	35-55
No. 30	10-30
No. 200	2-9

- L. Controlled Low Strength Material (Flow Fill)
 1. Product shall be a lean, sand-cement slurry, "flowable fill" or similar material with a 28-day unconfined compressive strength between 50-200 psi.

2.2 EROSION AND SEDIMENT CONTROL ACCESSORIES

- A. Comply with all applicable municipal or local Municipal Separate Storm Sewer System (MS4) requirements.
- B. Silt Fence Fabric: woven polypropylene
 1. Mirafi 100X, "Envirofence"
 2. Or accepted substitution
- C. Temporary Slope Stabilization Mat (short term): 1.5 pound photodegradable polypropylene top and bottom nets, 100% straw fiber matrix, with a longevity of 12 months.
 1. North American Green S150
 2. Or accepted substitution
- D. Temporary Slope Stabilization Mat (extended term): 3.0 pound UV-stable polypropylene top net, 1.5 pound photodegradable polypropylene bottom net, 70% straw/30% coconut fiber matrix with a longevity of 24 months.
 1. North American Green SC150
 2. Or accepted substitution

- E. Biodegradable Slope Stabilization Mat (short term): 9.3 pound leno-woven biodegradable jute top net, 7.7 pound woven biodegradable jute bottom net, 100% straw fiber matrix with a longevity of 12 months.
 - 1. North American Green S150BN
 - 2. Or accepted substitution
- F. Biodegradable Slope Stabilization Mat (extended term): 9.3 pound leno-woven biodegradable jute top net, 7.7 pound woven biodegradable jute bottom net, 70% straw/30% coconut fiber matrix with a longevity of 18 months.
 - 1. North American Green SC150BN
 - 2. Or accepted substitution
 - 3. Mirafi 100X, "Envirofence"
 - 4. Or accepted substitution

PART 3 EXECUTION

3.1 EXAMINATION

- A. Field verify the location of all underground utilities, pipelines and structures prior to excavation
- B. Maintain service to pipelines indicated on Drawings during construction

3.2 PERFORMANCE – GENERAL

- A. Perform work in a safe and proper manner with appropriate precautions against hazard
- B. Protect adjacent structures and surrounding areas from damage during excavation, filling, and backfilling
- C. Provide adequate working space and clearances for work performed within excavations and for installation and removal of utilities
- D. Provide temporary bridges for roadways, walkways, driveways, etc.
- E. Contain all construction activity on the designated site and limits of work. Cost of restoration off site will be borne by the Contractor

3.3 SITE PREPARATION

- A. Clearing and Grubbing
 - 1. Clean and strip subgrade for fills and embankments of surface vegetation, sod, tree stumps and organic topsoil
 - 2. Work shall be conducted such that damage to property is prevented and safety of employees implemented
 - 3. Remove and dispose of tree stumps and roots over 3 inches in diameter to a minimum depth of 18 inches below the natural surface
 - 4. Remove debris, all trees, underbrush, stumps, roots and other combustible materials from site daily and dispose of off-site

- a. On-site burning is not permitted
- 5. Backfill all excavated depressions including grub holes with approved material

B. Tree Protection

- 1. Do not remove trees outside fill or excavated areas, except as authorized by Owner
- 2. Protect trees, trunks, and roots of existing trees on site which are to be retained
 - a. Fence or box trees before any construction Work commences
 - b. Do not permit heavy equipment, vehicles, or stockpiles within branch spread or under tree canopies
 - c. If construction Work close to trees to remain is unavoidable, trim or prune to obtain working space necessary in lieu of completely removing trees.
 - d. All cut surfaces shall be coated with an approved tree paint
 - e. Trenching: If required near or around trees to be protected, Contractor shall avoid damage by equipment by careful hand tunneling under or around tree roots. Avoid injury of roots due to exposure or construction activities.
 - f. Damage
 - i) If any tree to be protected is damaged during the Working being performed, the Contractor shall repair or remove and replace the tree(s) at no additional cost to the Owner
 - ii) Replace with approved trees of equal caliper and height

C. Topsoil Stripping

- 1. Strip on-site material meeting the topsoil definition to a minimum depth of 4 inches from areas to receive grading as shown on Drawings
- 2. Stockpile topsoil in areas designated by Owner where it will not interfere with construction operations and activities and existing facilities
- 3. At the completion of work in each area, place and grade topsoil to maintain gradient as indicated and required. Roughen surface for erosion control

D. Waste and Debris

- 1. Stockpile all acceptable grubblings for reuse in native revegetation areas
- 2. Remove and dispose of all waste materials and debris from clearing, grubbing, stripping and demolition off site

3.4 PROTECTION OF EXISTING UTILITIES AND STRUCTURES

- A. Excavation and backfill operations shall be performed in such a manner to prevent cave-ins of excavations or the undermining, damage or disturbing of existing utilities and structures or of new work.
- B. Backfill shall be placed and compacted so as to prevent future settlement or damage to existing utilities and structures, and new work
- C. Any damage due to excavation, backfilling, or settlement of the backfill, or injury to persons or damage to property occurring as a result of such damage shall be the responsibility of the Contractor. All costs to repair such damage, in a manner satisfactory to the Engineer, shall be borne by the Contractor at no additional expense to the Owner

3.5 EXCAVATION

A. General

1. All materials encountered during excavation, regardless of type, character, condition or composition, shall be unclassified excavation
2. Estimate quantity of various materials included prior to submitting Bid Form. Rock encountered shall be handled at no additional cost to Owner.
3. Sequence of all excavation operations shall be such as to ensure the most efficient reuse of excavated materials where suitable.
4. Protect excavated material from becoming frozen
5. Suitable materials shall be used or stockpiled for later use in backfill and subgrade preparation. All unsuitable material shall be removed from the site and legally disposed

B. Blasting

1. Blasting or other use of explosives is not permitted

C. Dewatering

1. General

- a. All dewatering activities in accordance with all federal, state, and local regulations regarding site drainage, dewatering, and erosion and sediment control including permitting requirements
- b. Dewatering to surface waterways requires Colorado Department of Public Health and Environment dewatering permit. Contractor must obtain dewatering permit and comply with discharge requirements therein, if necessary
- c. Provide dewatering system of sufficient size and capacity to prevent ground and surface water flow into the excavation and to allow all work to be installed in a dry condition
- d. Keep each excavation dry during subgrade preparation and continually thereafter until the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result
- e. For excavations extending to (or below) the groundwater elevation; keep groundwater level a minimum of 12 inches below bottom of excavation.
- f. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property
- g. Maintain all drainage pipes, keep clean and free of sediment during construction and final cleanup
- h. No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head

2. Design

- a. Contractor shall be responsible for the accuracy of the Drawings, design data, operational records required, installation, operation, maintenance, and any failure of any component of the system

3. Damages

- a. Contractor shall be responsible for and shall repair without cost to the Owner any damage to work in place, or other contractor's equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation including,

damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor's negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system

4. Maintaining Excavation in Dewatered Condition
 - a. Dewatering shall be a continuous operation. Interruptions due to power outages, or any other reason will not be permitted
 - b. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails.
5. System Removal
 - a. Remove dewatering equipment from the site, including related temporary electrical service

D. Borrow and Spoils

1. Location, size, shape, depth, drainage, and surfacing of borrow or spoil pits shall be acceptable to Engineer and Owner. Provide Engineer with detailed plans prior to construction
2. Make all areas regular in shape with graded and surfaced side and bottom slopes when completed
3. Cut side slopes not steeper than 1:1 and uniform for the entire length of any one side
4. Final grade for disturbed areas of borrow shall have uniform slope (maximum slope = 4:1, minimum slope = 50:1)
5. Contractor shall be responsible for compliance with Colorado Discharge Permit System (CDPS) and local erosion control permitting requirements for any and all on-site and off-site, disturbed spoil and borrow areas. Upon completion of spoil and/or borrow operations, clean up spoil and/or borrow areas in a neat and reasonable manner to the satisfaction of off-site property owner, if applicable, Owner, and Engineer

E. Stockpiles

1. Segregate materials suitable for the following:
 - a. Topsoil
 - b. Fills
 - c. Backfill
 - d. Spoils and waste only
2. No excavation shall be deposited or stockpiled at any time so as to endanger stability of banks or structures, health of trees and shrubs to be protected, or portions of the Work, either by direct pressure or indirectly by overloading banks contiguous to the operation
3. Stockpile soil materials away from edge of excavations
4. Do not obstruct or prevent access to roads, driveways, ditches, natural drainage channels, and utility control devices
5. If in result of adjacent structures, easement limitations, or other restrictions sufficient storage is not available within Project limits, Contractor shall arrange for off-site areas for stockpiling and for moving material to and from the storage area at no additional cost to the Owner

F. Excess Materials

1. Use excess excavated materials in fills as indicated on the Drawings to the extent needed
2. Contractor is responsible for disposing of excess excavated materials from the site to a location approved by the Owner or Engineer and permitted with local authorities.

G. Waste Materials

1. Waste materials are considered unacceptable materials for compaction or placement fill and shall not include environmental pollutants, hazardous substances or waste, hazardous products and by-products
2. Remove debris, junk, broken concrete, broken asphalt, rock, stones, stumps, logs, roots, and other unsuitable material from the site and legally dispose of materials off site at locations arranged for by the Contractor

H. Trench Excavation

1. Establish alignment and grade or elevation from offset stakes provided by Contractor's surveyor
2. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the Drawings
3. Except as otherwise required, excavate trenches below the underside of pipes as indicated on the Drawings to provide for installation of pipe bedding
4. Provide concrete, or other foundations made necessary by unstable soil as directed by Engineer
5. Comply with pipe specification sections regarding vertical and horizontal alignment and maximum deflections
6. Do not open more trench in advance of pipe laying than is necessary to expedite the work; not more than 200 feet
7. Methods
 - a. Excavate trenches by open cut methods except where boring or tunneling is indicated in the Contract documents, required by jurisdictional agencies or permitted by Engineer
 - b. Mechanical excavation
 - i) Do not use where its operation would damage buildings, culverts, or other existing property, structures, or utilities above or below ground; hand excavate only in such areas
 - ii) Use mechanical equipment of a type, design, and construction and operated to provide the following:
 - a) Rough trench bottom elevation can be controlled
 - b) Uniform trench widths and vertical sidewalls are obtained from 1 foot above the top of the installed pipe to the bottom of the trench
 - c) Trench alignment is such that pipe is accurately laid to specified alignment and is centered in the trench with adequate clearance between pipe and trench sidewalls
 - iii) Do not undercut trench sidewalls
 - iv) Recompect trench bottom disturbed by bucket teeth prior to placement of embedment material

8. Trench Depth

- a. Where grades or elevations are not fixed on the Drawings, excavate trenches to provide a minimum depth of backfill cover over the top of pipe as follows.
- b. Coordinate depth of cover with utility owners. Increase depth as required by utility owner and at crossings.
 - i) 4.5 feet for sanitary sewer
 - ii) 2.5 feet for electric conduit
- c. Increase depth as required at vertical curves and for clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades
- d. Measure pipe cover depth vertically from top of pipe to finished ground or surface elevation

9. Trench Width

- a. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, and placement of embedment, without undercutting
- b. No excessive trench widths will be allowed to avoid the use of sheeting or shoring and bracing
- c. If needed to reduce earth loads to prevent sliding, cut banks back on slopes which extend not lower than 1 foot above the top of the pipe
- d. Stipulated minimum clearances are minimum clear distances, not minimum average distances
- e. Limiting trench widths and permissible clearances from 6 inches above top of pipe to trench bottom for installed piping

Pipe Size (inch)	Minimum Trench Width	Maximum Trench Width
4	1' 6"	2' 6"
6	1' 6"	2' 6"
8	1' 8"	2' 8"

10. Trench Side Walls

- a. Shall be sloped, shored, sheeted, braced, or otherwise supported by means of sufficient strength to protect workmen in accordance with applicable rules and regulations established for construction by the federal, state, and local ordinances and regulations
- b. Sheet and brace where necessary and as specified herein

11. Trench Bottom

- a. Shall be thoroughly protected and maintained when suitable natural materials are encountered
- b. Shall be thoroughly compacted and in approved condition prior to placing pipe bedding, if required
- c. Where in earth, trench bottoms for 6 inches and smaller pipe may be excavated below pipe subgrade and granular embedment provided
- d. Whenever so directed by Engineer, excavate to such depth below grade as Engineer directs and bring the trench bottom to grade with such material approved by Engineer

12. Trench Stabilization

- a. Thoroughly compact and consolidate subgrades for precast structures and utility trench bottoms so they remain firm, dense and intact during required construction activities
- b. Remove sub grade materials rendered unsuitable by excessive wetting and replace with approved backfill material at no additional cost to the Owner
- c. Reinforce subgrades with crushed rock or gravel if mucky during construction activities
- d. Finished elevation of stabilized subgrades are to be at or below subgrade elevations indicated on Drawings

13. Cuts in existing surface construction

- a. No larger than necessary to provide adequate working space
- b. Cut a clean groove not less than 1½ inch deep along each side of trench or around perimeter of excavation area
- c. Remove pavement and base pavement to provide shoulder not less than 6 feet wide between cut edge and top edge of trench
- d. Make pavement cuts to and between straight or accurately marked curved lines parallel to trench centerline or limits of excavation
- e. Where the trench crosses the drives, walks, curbs, or other surface construction, remove and replace the surface construction between saw cuts as specified for pavement

I. Pavement Overexcavation

1. Excavate subgrade for asphalt pavement areas and drives per the lines, grades, and dimensions indicated on Drawings within a tolerance of plus or minus 0.05 foot.

3.6 SHEETING, SHORING AND BRACING

- A. Provide proper and substantial sheeting, shoring, and bracing, in accordance with OSHA Standards as required, to prevent caving or sliding, to protect workmen and the Work, and to protect existing structures and facilities
- B. Contractor shall make his own assessment of existing conditions including adjacent property, the possible effects of his proposed temporary works and construction methods, and shall select and design such support systems, methods, and details as will assure safety to the public, adjacent property, and the completed work. Contractor shall be solely responsible for proper design, installation, operation, maintenance, and any failure of any component of the system
- C. Engineer review of Contractor's design and data does not relieve the Contractor from full responsibility for errors or from the entire responsibility for complete and adequate design and performance of the sheeting, shoring, and bracing system
- D. Design sheeting, shoring, and bracing to withstand all loads that might be caused by earth movement or pressure and to be rigid, maintaining shape and position under all circumstances.
- E. Submit sheet pile cut off wall design calculations, stamped by a Colorado licensed Professional Engineer

- F. Do not pull trench sheeting before backfilling
- G. Do not brace sheeting left in place against the pipe. Such sheeting shall be supported in a manner that precludes concentrated loads or horizontal thrusts on pipe
- H. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment is completed
- I. Contractor is responsible for obtaining all required permits or easements for encroachments into the public right-of-way and for coordinating any encroachments onto adjacent properties

3.7 SUBGRADE PREPARATION

- A. General
 - 1. Excavate or fill as required to construct subgrades to elevations and grades indicated
 - 2. Perform all wetting, drying, shaping, and compacting required to prepare a suitable subgrade
 - 3. Trench subgrade shall be scarified to a depth of 6 to 8 inches before compaction
 - 4. Exposed area to receive fill, backfill, or embankment shall be proofrolled to detect localized zones of excessively wet, unstable, organic, or low bearing capacity materials to extent as follows:
 - a. Proof roll as a single-pass operation with conventional compaction equipment during subgrade preparation and prior to placement of fill, and as a spot check process without need for complete coverage per unit area of tire for paved areas
 - b. Proof roll within limits of proposed construction of pavement
 - c. Proof roll at a maximum of 24 hours prior to paving to locate any soft spots. Contractor to stabilize any soft areas with aggregate base course and compact to specified values. Reshape subgrade and wet as required.
- B. Pavement subgrade:
 - 1. Over excavate and scarify existing soil as required under pavement areas to meet the moisture and compaction specifications herein to depth shown on Drawings
 - 2. Extend subgrade preparation a minimum of 1 foot beyond back of proposed pavement
 - 3. If Contractor fails to place the sub base, base course, or initial pavement course within 24 hours or the condition of the subgrade changes due to weather or other conditions, proof rolling and correction shall be performed again at the Contractor's expense
- C. Refer to geotechnical report and Larimer County for additional requirements for subgrade preparation requirements

3.8 FILL AND BACKFILL

- A. General requirements
 - 1. Compact with mechanical tampers approved by geotechnical engineer

- B. Any excavations improperly backfilled or where settlement occurs shall be reopened to the depth required then refilled with approved materials and compacted, and the surface restored to the required grade and condition, at no additional costs to the Owner
- C. Preparation
 - 1. All areas to be filled or backfilled shall be free of vegetation, topsoil, wet materials, unsatisfactory soil materials, obstructions, deleterious materials, construction debris, refuse, compressible or decayable materials and standing water from ground surface prior to placing fills
 - 2. Do not backfill or construct fills during freezing weather. Backfill or construct fills only when temperature is 35°F and rising
 - 3. Do not use frozen materials, snow, or ice in any backfill or fill area
 - 4. Do not backfill or construct fill on frozen surfaces
- D. Structural Backfill
 - 1. Remove all debris from excavation prior to placement of material
 - 2. Place backfill and fill materials adjacent to structures evenly and to required elevations. Take care to prevent wedging action of backfill against structures
 - 3. Place backfill in level layers not to exceed 6 inches in loose
 - 4. Backfill simultaneously on all sides of structures
 - 5. Compact as specified herein
- E. Structural Fill
 - 1. Below pavements
 - a. Place structural fill on prepared and approved subgrade in any overexcavated areas in order to bring elevations to bottom of pavement
 - b. Subgrade preparation shall be as specified herein
 - c. Lifts shall not exceed 6 inches in loose depth thickness
 - d. Compact as specified herein
 - 2. Place in horizontal layers at maximum uncompacted depth per compaction specifications herein and adequately to support items constructed or placed thereon
 - 3. Compact as specified herein
- F. Trench backfill
 - 1. Do not backfill until tests and inspections have been made and backfilling is authorized by Engineer. Use care in backfilling to avoid damage or displacement of pipe systems
 - 2. Compacted backfill is required for all trench excavations
 - 3. Thoroughly compact each layer to meet the moisture and compaction specification herein
 - 4. Where the trench for one pipe passes beneath the trench of another pipe, compact the backfill for the lower trench to the bottom of the upper trench
 - 5. Place suitable job excavated materials in 8 inch maximum non-compacted thickness, uniform layers
 - a. Increased layer thickness may be permitted for non-cohesive material if Contractor demonstrates to Engineer's satisfaction that specified compacted density will be achieved

- b. Use methods and equipment appropriate to the material to be compacted to prevent transmission of damaging shocks to pipe
- 6. Graded gravel
 - a. Deposit in uniform layers of 12 inch maximum uncompacted thickness
 - b. Compact with suitable vibrating roller or platform vibrator to not less than 70 percent relative density per ASTM D4253/D4254
- 7. Finish the top portion of backfill with a minimum of 4 inches of topsoil, or as specified on Drawings, whichever is greater, corresponding to, or better than, that underlying adjoining turf areas
- 8. Trench backfill within the public right-of-way shall conform to Larimer County street and utility standards
- 9. Trench backfill through unimproved areas should be restored to previous conditions and left 3" above adjacent grades to allow for settlement. Seed all disturbed areas according to seeding specifications.
- 10. Protection of trench backfill
 - a. Where trenches are constructed in ditches or other water courses, protect backfill from erosion
 - b. Install ditch checks where the ditch grade exceeds 1 percent
 - i) Minimum depth: 2 feet below the original ditch or water course bottom for the full bottom width
 - ii) Minimum width: 18 inches into the side slopes
 - iii) Minimum thickness: 12 inches

3.9 FILLS AND EMBANKMENTS

- A. Using suitable approved materials, shape, trim, and finish cut slopes to conform with contours and elevations indicated on Drawings
- B. Material shall be placed in the fill in successive layers 8 inches or less in thickness before compaction, each layer being approximately horizontal and extending to the full limit of the required cross section
- C. Thoroughly compact each layer by rolling or other means acceptable to Engineer to meet the moisture and compaction specifications herein
 - 1. Plow and scarify subgrade to a depth of 8 inches until uniform and free of large clods
 - 2. If degree of compaction is unsatisfactory, make necessary adjustments until specifications are met. Remove material placed over layers not satisfactorily compacted and Recompact unsatisfactory areas
- D. Spread and level material deposited in piles and windrows before compacting
- E. Refer to geotechnical report for additional requirements for fill and embankment preparation requirements

3.10 PIPE EMBEDMENT

- A. Embed pipes above and below the bottom of pipe as indicated on the drawings and as specified herein

- B. Spread and surface grade granular embedment to provide continuous and uniform support beneath pipe at all points
 - a. Level bottom layer at proper grade to receive and uniformly support pipe barrel throughout length
2. After grading, aligning, and placing pipe in final position, and shoring home, deposit and compact sufficient embedment under and around each side of the pipe to hold the pipe in proper position and alignment during subsequent operations
3. Place and compact embedment material uniformly and simultaneously on both sides of pipe to prevent displacement
4. Compacted embedment shall be compacted as specified herein
 - a. Maximum uncompacted thickness of layers: 6 inch

3.11 COMPACTION

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth
- B. Refer to geotechnical report for additional requirements for site development material, subexcavation, compaction, and related earthwork operations
- C. Percentage of Maximum Dry Density Requirements: Moisture treat and compact soil to not less than the following percentages of maximum dry density and to within moisture content range according to ASTM D 698 as follows:

Surface Improvement	Compaction %	Moisture Content
Structures	95%	-2 to +2
Paved Areas	95%	-2 to +2
Utility Trenches	95%	-2 to +2
Lawns or Unpaved Areas	90%	-2 to +2
Public Right-of-way	Per municipal standards	

3.12 SITE GRADING

- A. When rock is encountered in paving areas outside buildings, overexcavate to 6 inches below final grade and backfill to grade with approved earth compacted-in-place
- B. Grading
 1. After completion of all other outside work and after backfilling is completed and settled, bring to grade at the indicated elevations, slopes and contours, all areas being graded on site
 2. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand work
 3. Grade all surfaces for effective drainage, provide a 2 percent minimum slope except as otherwise required
 4. Slope grades to direct water away from buildings and prevent ponds from forming where not designed.
 5. Provide a smooth transition between adjacent existing grades and new grades
 6. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances

7. Finish grades shall be no more than 0.1 foot above or below those indicated

3.13 DRAINAGE MAINTENANCE

- A. Do not backfill trenches across roadways, drives, walks or other trafficways adjacent to drainage ditches or water courses prior to backfilling the trench on the upstream side of the trafficway to prevent impounding water after pipe is laid
- B. Backfill so that water does not accumulate in unfilled or partially filled trenches
- C. Remove materials deposited in roadway ditches or other water courses crossed by the trench line immediately after backfilling is completed and restore ditches and water courses to original section, grade, and contours
- D. Do not obstruct surface drainage any longer than necessary
- E. Provide and maintain temporary bridges and other structures across unfilled trenches as required to maintain traffic

3.14 SLOPE AND CHANNEL STABILIZATION

- A. Cover channel banks, slopes, bottom and thalweg (water flowline at lowest point in channel) with erosion control fabric mat where grade is 3H to 1V or greater and where indicated on the Drawings
- B. Lay fabric smoothly on surface, bury top end of each section in 6-inch deep excavated topsoil trench. Provide 6-inch overlap minimum of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil
- C. Secure outside edges and overlaps at 48 inch intervals with 4-inch to 6-inch U-shaped type pins or wooden stakes depending on ground condition
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil
- E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches
- F. Maintain integrity of erosion control fabric
- G. Seed disturbed areas under provisions of Section 02950.

3.15 SETTLEMENT

- A. Warranty for settlement of all fills and backfills is stipulated in the General Conditions from final completion of Contract under which work is performed
- B. Repair or replace within 30 days after notice by Engineer or Owner

3.16 FIELD QUALITY CONTROL

- A. Provide under provisions of General Conditions and Division One Specifications
- B. Coordinate testing with Owner. Owner will provide all field testing to determine compliance of in-place and backfill materials and compaction in accordance with the specifications
- C. Fills and Embankment
 - 1. Two moisture-density relationship tests, ASTM D698, on each type of fill material
 - 2. One in-place compaction test for each 5,000 square feet every 1.5 feet of vertical lift of material placed
 - 3. Additional in-place compaction tests at the discretion of the Owner
- D. Pipe Embedment and Backfill
 - 1. Two moisture-density relationship tests, ASTM D698, or two relative density tests, ASTM D4253/D4254, as appropriate for each type of embedment or backfill material proposed, except granular embedment material
 - 2. One in-place compaction test every 200 lineal feet of trench in the compacted embedment zone and at every 1.5 feet of vertical lift of backfill materials, ASTM D2922/D3017
 - 3. Additional in-place compaction tests at the discretion of the Owner
- E. Pavement Subgrades
 - 1. At a minimum, two moisture-density relationship tests, ASTM D698, or two relative density tests, ASTM D4253/D4254, as appropriate and adequate for each type backfill material proposed.
 - 2. Additional in-place compaction tests at the discretion of the Owner
- F. Retests of failed compaction shall be performed by Owner, but paid for by Contractor

END OF SECTION

SECTION 02446

HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Section includes requirements for Horizontal Directional Drilling (HDD) of High Density Polyethylene (HDPE) Pressure Sewer pipe.

1.2 RELATED SECTIONS

- A. Section 01010 – Summary of Work
- B. Section 01020 – Geotechnical Report
- C. Section 01340 – Shop Drawings, Product Data, and Samples
- D. Section 01400 – Quality Control
- E. Section 02300 – Earthwork
- F. Section 02530 – Sanitary Sewerage System

1.3 REFERENCES

- A. MUTCD – Manual of Uniform Traffic Control Devices
- B. Horizontal Earth Boring and Pipe Jacking Manual No. 2, latest revision

1.4 DESIGN REQUIREMENTS

- A. Contractor to design casing pipe wall thickness based on worst condition of any anticipated loads during or after construction. Specified thickness for pipe casings are the minimum required regardless of the Contractor design. However, thicker wall may be required based on the design by the Contractor based upon the superimposed loads and not upon the loads which may be placed on the pipe as a result of drilling operations
- B. Provide increased pipe strength necessary to withstand drilling loads
- C. Contractor shall obtain and comply with necessary permit(s) for work within Larimer County Right-of-Way

1.5 QUALITY ASSURANCE

- A. Experience: Actively engaged in horizontal directional drilling under water crossings for minimum of three years

- B. Field supervisory personnel: Experienced in the performance of work and tasks as stated herein for minimum of three years

1.6 SUBMITTALS

- A. Submit under provisions of 01340
 - 1. Working Drawings and written procedure describing in detail proposed method and entire operation for information only including, but not limited to:
 - a. Size, capacity and arrangement of equipment.
 - b. Location and size of drilling and receiving pits.
 - c. Dewatering and methods of removing spoils material.
 - d. Method of installing detection wire and pipe.
 - e. Type, location and method of installing locator station.
 - f. Method of fusion pipe segment and type of equipment.
 - g. Type of cutting head.
 - h. Method of monitoring and controlling line and grade.
 - i. Detection of surface movement.
 - j. Bentonite drilling mud for information only:
 - i) Products information, material specifications, and handling procedures.
 - ii) Material safety data sheet and special precautions required.
 - iii) Method of mixing and application.

1.7 PROJECT CONDITIONS

- A. Complete HDD so as not to interfere with, interrupt, or endanger surface and activity thereon.
- B. Do not use HDD in rock stratum or subsoil consisting of boulders and underground obstructions that impede the process.
- C. Follow applicable local, state and federal ordinances, codes, statutes, rules, and regulations.

1.8 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of 01700
- B. Accurately record actual locations of pipe elevations
- C. Identify and describe unexpected variations in and/or discovery of uncharted utilities

1.9 REGULATORY REQUIREMENTS

- A. Contractor, not Owner, shall prepare, submit, pay, and otherwise obtain all necessary permits from all appropriate entities

- B. Contractor shall obtain and pay for bonds or indemnity required by the permits for protection against damage and interference with traffic and service by construction activities

1.10 DELIVERY STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600
- B. Coordinate storage of materials with Owner and Engineer

PART 2 PRODUCTS

2.1 MATERIALS

- A. Pipe.
 - 1. HDPE: See Section 02530
 - 2. HDPE Joints:
 - a. Butt fusion joining technique for joining pipe segments installed by HDD. See Section 02530.
 - b. When joining HDPE pipe at ends of directional drilling runs fusion bond to adjacent pipe section.
 - i) Butt fusion joining technique: See Section 02530
 - c. Mechanical Couplings are not permitted for joining of directional drilled pipe sections.
- B. Drilling Fluid:
 - 1. Bentonite drilling mud compatible with environment.
 - 2. Waste oil or environmentally non-compatible polymers cannot be part of composition.
- C. Detection Wire: As specified in Section 02530
- D. Locator Station: As specified in Section 02530

PART 3 EXECUTION

3.1 PREPARATION

- A. Excavate pits following drawings and Section 02300.
- B. Provide equipment to guard against electrocution and alarm system on drilling equipment capable of detecting electrical current as it approaches electric lines.

3.2 OPERATION

- A. General.
 - 1. Determine drilling length and equipment pull strength for type of soil encountered.

2. Provide method to control line and grade.
 - a. Provide and maintain instrumentation that accurately locates pilot hole.
 - b. Drill pilot hole along path following Drawings to these tolerances:
 - i) Vertical alignment plus or minus 0.5 foot. Vertical path of pilot hole must not establish new high points not shown on Drawings.
 - ii) Horizontal alignment plus or minus 1.0 foot.
 - c. Include electronic monitoring of horizontal and vertical drilling head location. Obtain accuracy range within 1 inch of actual position of pipeline. Record position readings at maximum of 10 foot intervals.
 - d. At completion of pilot hole drilling, furnish tabulations of horizontal and vertical alignment to Engineer.
3. When water is encountered.
 - a. Provide and maintain dewatering system of sufficient capacity to remove water.
 - b. Keep excavation free of water until backfill operation is in progress.
 - c. Perform dewatering in manner that removal of soils particles are held to minimum.
 - d. Dewater into sediment trap following Section 02300 and Stormwater Management Plan
4. Maintain close observation to detect settlement or displacement of surface and adjacent facilities.
 - a. Notify Engineer immediately if settlement or displacement is detected.
 - b. Maintain safe conditions and prevent damage.

B. Drilling Operation.

1. Drilling Fluids.
 - a. Maintain drilling fluid in bore hole to increase stability of surrounding soil and reduce drag on pulled pipe.
 - b. Dispose of drilling fluid and other spoils at location following laws, ordinances, rules, and regulations of local jurisdiction.
 - c. Transport excess fluids and other spoils to disposal site, at no additional cost to the Owner.
 - d. Minimize drilling fluid at locations other than entry and exit points. Immediately clean up any drilling fluids that inadvertently surface.
 - e. Provide clean water for drilling, at no cost to the Owner, at Engineer's requirement.
2. Pilot Hole Drilling.
 - a. Angle entry hole so that curvature of pilot hole does not exceed allowable bending radius of HDPE pipe.
 - b. Be able to make a turn of up to 90 degrees and maintain curvature not to exceed allowable bending radius of HDPE pipe.
 - c. Alignment Adjustment and Restarts.
 - i) Follow pipeline alignment on Drawings within tolerances specified herein. Before adjustments, notify Engineer for approval.
 - ii) Notify Engineer when forward motion of operation is stopped by an obstruction.
 - a) Abandon in place with drilling fluid, unless Engineer directs otherwise.

- b) Upon Engineer's approval, attempt second installation at approved location
- iii) Withdrawals, abandonments, and restarts are at no additional cost to the Owner when HDD is provided as an option of installation of pipe.
- iv) Exercise caution including, but not limited to, locating utilities, drilling downholes (test pits) to observe drill stems or reamer assembly to clear other existing utilities at locations following Drawings.
- v) Keep the number of boring pits to a minimum, no closer than following distances, unless otherwise approved by Engineer.
 - a) Equipment must be capable of boring 250 feet for 4-inch diameter pipe

3.3 INSTALLATION

A. Installing HDPE Pipe.

1. Provide a swivel to reaming assembly and pull section of pipe to minimize torsional stress on pull section after drilling pilot hole.
2. Hold reaming diameter to 1.5 times outside diameter of HDPE pipe being installed.
3. Protect pull section as it proceeds during pull back so it moves freely and is not damaged.
4. Pull detection wire along with HDPE pipe. Extend wire into locator station at each end of HDPE pipe.
 - a. For HDD under river: Provide test stations at entry and exit points
5. When connecting to adjacent pulled or non-pulled section of HDPE pipe, allow pull section of pipe to extend past termination point. Make tie-ins the next day after pullback of HDPE pipe.
6. Replace portions of pipeline not in compliance with Contract Documents at Engineer's direction and at no additional cost to the Commission.

B. Installing Locator Station.

1. Locator Stations.
 - a. At each end of HDPE pipe. As indicated on drawings and as specified in Section 02530
2. Detection Wire.
 - a. Install detection wire without splices
 - b. Terminate detection wire inside locator box using proper sized crimp type connectors on wire ends.
 - c. Connect each wire to terminal maintaining at least 18 inches slack in each wire for underground flush mounted locator stations.
 - d. Neatly coil slack wire in test station below terminal board.
 - e. Locate wires on top and along HDPE pipe.
 - f. Allow adequate slack and support to protect wires from damage during backfilling operations.
 - g. Test each detection wire for continuity after backfill is completed.
 - i) If test for continuity is negative, repair or replace at Engineer's direction.
 - ii) After continuity is verified, connect each detection wire to terminal block in locator station.

3.4 FIELD QUALITY ASSURANCE

- A. Perform field testing of HDPE pipe following Section 02530.

END OF SECTION

SECTION 02530
SANITARY SEWER SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, and Division 1 and other related specification sections apply to work of this section.

1.2 SECTION INCLUDES

- A. Sanitary Sewer System
 - 1. High Density Polyethylene (HDPE) for pressure sanitary sewer
 - 2. Fittings and other appurtenances required for a complete installation

1.3 RELATED SECTIONS

- A. Division 1
- B. Section 02300 – Earthwork
- C. Section 03400 – Precast Concrete Structures
- D. Section 11306 – Duplex Submersible Pump Station

1.4 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. A126 – Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 - 2. A240 – Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - 3. A307 – Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
 - 4. A536 – Ductile Iron Castings
 - 5. B61 – Steam or Valve Bronze Castings
 - 6. C443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
 - 7. C497 – Test Methods for Concrete Pipe, Manhole Sections, or Tile
 - 8. D698 – Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 - 9. D1248 – Polyethylene Plastics Extrusion Materials for Wire and Cable
 - 10. D1330 – Rubber Sheet Gaskets
 - 11. D1351 – Thermoplastic Polyethylene Insulation for Electrical Wire and Cable
 - 12. D1784 – Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (PVC)
 - 13. D1785 – Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - 14. D2274 – Underground Installation of Thermoplastic Pressure Piping

15. D2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
16. D2837 – Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
17. D3035 – Polyethylene (PE) Plastic Pipe (DR-PR.) Based on Controlled Outside Diameter
18. D3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
19. D3261 – Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
20. D3350 – Polyethylene Plastics Pipe and Fittings Materials
21. F412 – Standard Terminology Relating to Plastic Piping Systems
22. F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe
23. F714 – Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
24. F1055 – Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing
25. F2164 – Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure

B. American Water Works Association (AWWA)

1. C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
2. C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems
3. C110 – Ductile-Iron and Gray-Iron Fittings
4. C111 – Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
5. C115 – Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
6. C150 – Thickness Design of Ductile-Iron Pipe
7. C151 – Ductile-Iron Pipe, Centrifugally Cast, for Water
8. C153 – Ductile-Iron Compact Fittings
9. C504 – Rubber-Seated Butterfly Valves, 3 In. (75 mm) Through 72 In. (1,800 mm)
10. C512 – Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service
11. C550 – Protective Interior Coatings for Valves and Hydrants
12. C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances
13. C906 – Polyethylene (PE) Pressure Pipe and Fittings 4 in. (100 mm) Through 63 In. (1,600 mm) for Water Distribution and Transmission

C. American National Standards Institute (ANSI)

1. B16.1/16.5 – Pipe Flanges and Fittings Package

D. Occupational Safety and Health Administration (OSHA)

1. Part 1926 – Safety and Health Regulations for Construction

1.5 SUBMITTALS

A. Submit under provisions of Division One Specifications

- B. Shop Drawings: Provide piping layout and assembly drawings with fitting dimensions. Provide sufficient information to verify compliance with specifications

- C. Product Data: Submit on pipe and gasket materials, pipe fittings, and accessories. Provide manufacturer's catalog information with recommended installation requirements
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements and applicable standards
- E. Test Reports: Submit reports of field exfiltration/infiltration and pressure tests

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with the requirements of the Town of Berthoud, Larimer County, and CDPHE Stormwater and/or Groundwater Discharge Permit, notes on the drawings and as specified herein.

1.7 SOURCE QUALITY CONTROL

- A. Identification Marks:
 - 1. Clearly and permanently mark in green to identify as sewer pipe at not greater than 5 foot intervals with manufacturer's name, trademark, pipe size (nominal size and OD base IPS), PE 3608, SDR-9 appropriate legend such as HDPE, ASTM D3035 or ASTM F714, date of manufacture, and point of origin.
 - 2. Pipe not marked as specified herein will be rejected.

1.8 REGULATORY REQUIREMENTS

- A. Conform to all municipal codes and ordinances, laws and regulations of the State of Colorado, Town of Berthoud, Larimer County and CDPHE Stormwater and/or Groundwater Discharge Permits, and/or Construction Dewatering Permits, as required.

1.9 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division One Specifications
- B. Accurately record actual locations of pipe, pipe fittings, and invert elevations
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities

1.10 DELIVERY, STORAGE AND HANDLING

- A. Delivery
 - 1. Deliver, store, protect, and handle under provisions of Division One Specifications
 - 2. The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage
 - 3. The transportation carriers shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked and restrained during transportation such that the pipe is not nicked, gouged, or physically damaged

4. Ship rubber gaskets in cartons and store in a clean area away from grease, oil, ozone producing electric motors, heat and the direct rays of the sun

B. Storage

1. Store pipe, fittings and gaskets in clean locations protected from environmental conditions such as: (direct sunlight, heat, mud.. etc)
2. Do not use pipe and fittings stored in direct sunlight for periods in excess of 18 months
3. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations.

C. Handling

1. Handle so as to insure installation in sound, undamaged condition. Do not damage the pipe by impact, bending, compression or abrasion during handling or storage. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment.
2. Use equipment, tool, and methods for unloading, reloading, hauling, and laying that do not damage pipe
 - a. Use hooks/hands with broad, well-padded contact surfaces for insertion into pipe ends or nylon protected slings to handle pipe
3. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method.
4. Fused segments of the pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Plugs and Caps: Use pipe plugs or caps provided by the pipe manufacturer and approved by the Engineer for pipe stubouts.
- B. Cleanouts: Provide as indicated, pipe extension to grade with ferrule and countersink cleanout plug. Provide round cast-iron access frame over cleanout, with heavy duty secured scoriated cover with lifting device cast with the word "SANITARY".

2.2 HDPE PRESSURE PIPING

A. Manufacturers

1. High Country Fusion
2. Performance Pipe
3. WL Plastics
4. ISCO Pipe

5. Or accepted substitution
- B. The following piping shall be HDPE pipe as indicated on the drawings and as specified herein
1. Sewer force main: 4-inch, 8-inch diameter
 2. Diameters: Ductile Iron Pipe Size
 3. Pressure rating of 200 PSI - use SDR 9 pipe type
- C. Material
1. The pipe shall be manufactured from a PE 3608 resin compound listed with the Plastic Pipe Institute (PPI) as TR-4.
 2. The resin material shall be in accordance with ASTM D3350 with a minimum cell classification of 345464C.
 3. This resin material shall have a Long Term Hydrostatic Strength of 1600 PSI when tested in accordance to ASTM D2837.
 4. Pipe dimensions shall be in accordance with ASTM D3035 as a minimum.
 5. The final compounded material shall contain a minimum of 2% carbon black
 6. The pipe shall contain no recycled material except that generated by the pipe manufacturer in their own plant from resin compound of the same specification and raw material supplier. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.
 7. Pipe shall have a manufacturing standard of ASTM F714 and be manufactured by an ISO 9001 certified manufacturer.
 8. All pipes and fittings shall be suitable for use as pressure conduits, listed as NSF 14, and per AWWA C906 Pressure Class (PC) 100 have a nominal burst value of three and one-half times the Working Pressure Rating (WPR) of the pipe and/or fitting
- D. Fittings
1. All fittings shall be PE 3608 HDPE, minimum Cell Classification of 345464C as determined by ASTM D3350, and approved for AWWA use.
 2. All fittings shall be of the same base resin as the pipe.
 3. All fittings shall have a working pressure rating equal to the pipe unless otherwise specified in the plans.
 4. All fittings shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.
 5. Butt Fusion Fittings
 - a. Molded butt fusion fittings shall be in accordance with ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabricated from HDPE pipe conforming to this specification.
 6. Compression Type Mechanical Coupling
 - a. Suitable for joining HDPE to HDPE, HDPE to PVC, or HDPE to DIP
 - b. Factory coat coupling internally and externally with a fusion bonded epoxy
 - c. Reinforce HDPE pipe with a split ring type stiffener in pipe bore
 - i) Size stiffeners for size of HDPE pipe being joined
 - ii) Supply feature that prevents stiffener from sliding completely into pipe
 - iii) Size stiffeners for length of mechanical coupling and not to extend outside of body of mechanical coupling

- iv) Mark stiffener with pipe diameter
 - v) Factory coat stiffeners internally and externally with fusion bonded epoxy
- d. Use seal and restraint type coupling. Requirements for type of couplings are specified herein or shown on Drawings
 - i) Approved Manufacturers:
 - a) JCM, Industries
 - b) Sur-Grip
 - c) Romac
 - d) Or accepted substitution
- E. Transition Couplings: One piece assembly
 - 1. One end being HDPE pipe with butt fusion joining technique
 - 2. Other end being either steel or brass pipe threaded suitable for connecting ductile iron, threaded fittings, or threaded valves
 - a. Approved Manufacturers:
 - i) Central Plastics Company
 - ii) Industrial Pipe Fittings, Inc.
 - iii) Or accepted substitution
- F. Socket fusion, hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe

2.3 DUCTILE IRON PIPING

- A. Manufacturers
 - 1. U.S. Pipe
 - 2. American Cast Iron Pipe Company
 - 3. Griffin Pipe Products Company
 - 4. McWane Cast Iron Pipe Company
 - 5. Pacific States Cast Iron Pipe Company
 - 6. Or accepted substitution
- B. The following piping shall be DIP pipe as indicated on the drawings and as specified herein
 - 1. Pressure clean-outs piping: 4-inch diameter
 - 2. Combination air release/vacuum breaker valve vault interior piping: 4-inch diameter
 - 3. Buried pipe from lift station to valve vault: 2-inch diameter
 - 4. Valve vault interior piping: 2-inch and 4-inch diameter
 - 5. Pressure rating of 350 PSI
- C. Shall be in accordance with ANSI A21.50/AWWA C150
- D. Shall be manufactured in accordance with ANSI A21.51/AWWA C151
- E. Fittings
 - 1. Ductile iron full body fittings
 - a. ANSI A21.10/AWWA C110, ASTM A536
 - b. 24-inch and below: 350 psi rating, mechanical joint

2. Ductile iron compact fittings
 - a. ANSI A21.53/AWWA C153
 - b. 16-inch and below: 350 psi rating, mechanical joint
3. Fittings shall have a pressure rating no less than that of adjoining pipe
4. Fittings for pipe with mechanical or push-on joints shall have mechanical joints in accordance with ANSI A21.11/AWWA C111
5. Comply with requirements for restrained fittings as indicated on Drawings

F. Joints

1. All joints shall be of restrained type unless otherwise indicated on Drawings
2. Flanged joints
 - a. Flanged joints shall be provided for all interior and exposed exterior pipe unless otherwise indicated or specified
 - b. Flanges
 - i) General use: ANSI A21.15/AWWA C115 and ANSI B16.1, Class 125
 - c. Gaskets, nuts and bolts
 - i) Bolts shall conform to ASTM A307, grade B
 - ii) Nuts and bolt heads shall be hexagonal
 - iii) Gaskets shall conform to ANSI B16.21 and ASTM D1330, 1/8-inch, full face oil resistant Grade I synthetic rubber
 - iv) 12-inch and smaller
 - v) Shall have nominal inside diameters no larger than inside diameters per ANSI B16.21

G. Corrosion Control

1. Ductile-iron Pipe and Fittings Shop Lining and Coating
 - a. Shall be in accordance with AWWA C104
 - b. Cement-lined, ANSI A21.4
 - c. Bituminous coating: Manufacturer's standard
 - d. Manufacturer's standard corrosion control coating and/or paint will be acceptable if it is functionally equivalent and compatible with specified field coatings
2. Polyethylene encasement for all buried ductile iron pipe, all fittings and valves, AWWA C105: seamless tube, ASTM D1248, Type I, Class C, Grade E-1, 8 mils thick
 - a. Joint tape: Self-sticking, PVC or polyethylene, 2-inch wide, 10 mils thick
 - i) Kendall Polyken 900
 - ii) 3M Scotchrap 50
 - iii) Northtown Company
 - iv) Or accepted substitution
 - b. Strapping: Nonmetallic, water resistant, FS PPP-S-760, Type II
 - i) Entire fitting or valve shall be covered by a complete wrap of 48-inch wide polyethylene sheet material cover over each set of lugs

2.4 PVC GRAVITY SANITARY SEWER PIPE (NON-PRESSURE)

- A. The following piping shall be non-pressure PVC pipe for gravity sanitary sewer application as indicated on the drawings and as specified herein

1. Gravity sanitary sewer piping and fittings: 8-inch
- B. Pipe and fittings: ASTM D3034, T-1 wall, SDR 35, non-pressure pipe
 1. Cell classification: ASTM D1784
 2. Pipe length: 12-20 feet standard manufactured length for construction
- C. Joints: ASTM D3132 and F477 - Rubber gasket with one compression gasket ring, integral bell and spigot type
 1. Designed to hold pipe in alignment, provide flexibility, separate the ends of pipe lengths, resist applied earth pressures, and provide fluid tightness
 2. Rubber rings: ASTM F477

2.5 PVC DRAIN OR VENT PIPE (NON-PRESSURE)

- A. The following piping shall be non-pressure PVC pipe as indicated on the drawings and as specified herein
 1. Combination air release/vacuum breaker valve interior and exterior discharge vent piping and fittings: 1-inch and 4-inch diameter
- B. Pipe and fittings: Schedule 40 in accordance with ASTM D1784, ASTM D1785, ASTM D2466, ASTM D2122, and ASTM F412
- C. Joints:
 1. Solvent weld per manufacturer's recommendation
 2. Threaded: ANSI 82.1

2.6 AIR RELEASE AND VACUUM BREAKER COMBINATION VALVES

- A. Provide combination air release and vacuum breaker valves as indicated in schedule below and on Drawings
 1. Provide single body type that functions as both an air release and a vacuum breaker valve
 2. Valves shall be manufactured and tested in accordance with AWWA C512.
 3. Size as indicated on Schedule
 4. Provide a shutoff valve and transition piece from HDPE to NPT threaded connection on valve
 - a. Ball valve: compatible with butt fusion, HDPE fitting
- B. General
 1. Usage: Recommended for service up to 150 psi
 2. Bodies and covers:
 - a. Gray iron meeting requirements of ASTM A126 Class B
 - b. Globe style of 1-inch valves to increase float clearance and reduce clogging
 3. Exterior coating: universal alkyd primer
 4. Valve cleanout: 2" NPT
 5. Valve drain connection: 1" NPT
 6. Inlet and Outlet:
 - a. Inlet: NPT, 2-inch on 1-inch valves

- b. Outlet: NPT equal to valve size, 1-inch
- 7. Internals:
 - a. Metal internal parts only
 - b. Float sensitive skirt provided
 - c. Float, plug, guide shafts, and bushings: Type 316 stainless steel
 - d. Resilient seats: Buna-N
- C. Approved manufacturers:
 - 1. Val-Matic "Model 801A"
 - 2. Dezurik/APCO "Series 440 SCAV"
 - 3. Or accepted substitution
- D. Air Release/Vacuum Breaker Combination Valve Schedule

Station	Size	Working Pressure (psi)	Connection
16 + 52.74	1"	0-150	Screw
58 + 14.11	1"	0-150	Screw

2.7 ECCENTRIC PLUG VALVES

- A. Provide plug valves as indicated in schedule below and on Drawings
- B. General
 - 1. Quarter-turn non-lubricated eccentric plug valves
 - 2. Resilient faced plug
 - 3. Valves with vane type seat rings are not acceptable
 - 4. Valve ends to match connecting piping
 - a. Buried: Mechanical joint, ANSI A21.11/AWWA C111
 - b. Flanged: 125 lb, ANSI B16.1
 - c. Screwed valve ends shall be to the NPT standard
 - 5. Minimum Working Pressure Rating:
 - a. 175 psi
 - 6. Opening motion eccentric, lifting plug away from body seat
 - 7. Valve alignment
 - a. Valve shall be installed so that the plug is horizontal and rotates upward as the valve opens
 - b. Valve shall be installed with seat on low pressure side of valve
 - 8. Provided with fully adjustable plug position stops
 - 9. Plugs shall be eccentric type with no backing ring or frame
 - 10. Valve body cavity shall be smooth without protrusions or baffles
 - 11. Valve body plainly marked to indicate seat end
 - 12. Valve packing adjustment accessible without removing actuator from valve
- C. Valve Materials
 - 1. Plug and body: Cast iron, ASTM A126, Class B

2. Resilient plug facing or replaceable style body seats shall be synthetic rubber, neoprene, or Buna N compound suitable for use with water and wastewater applications
3. Seat rings shall be threaded, or welded of corrosion-resistant stainless steel (18-8), nickel, or Monel conforming to AWWA C504
4. Sprayed or plated mating seat surfaces are not acceptable
5. Bearings shall be replaceable. Sleeve type and thrust bearings in the upper and lower journals shall be corrosion-resistant stainless steel or bronze
6. Shaft seals shall be multiple O-ring, self-adjusting U-cup or chevron type packing conforming to AWWA C504
7. Pull-down packing is not acceptable
8. Shaft seals shall be field adjustable or replaceable without valve disassembly
9. Plug seat: Chloroprene (Neoprene)
10. Packing: Acrylonitrile Butadiene V-Type Cup
 - a. Dual U-cup
11. Upper thrust bearing: TFE
12. Body seat: Welded-in overlay seat of no less than 90% nickel
13. Upper and lower trunnion bearings: Sleeve type, 18-8 stainless steel
14. Valves complete with epoxy coating on the interior and exterior, manufacturer's standard corrosion resistant coating shall be acceptable

D. Testing

1. Valves shall be capable of drip-tight shut-off up to the full leak test rating
 - a. Test and certify pressure capacity in the reverse direction

E. Approved manufacturers:

1. DeZurik
2. Henry Pratt Company
3. Milliken
4. Val-Matic Valve and Manufacturing Corporation
5. Or accepted substitution

F. Plug Valve Schedule

Station	Size	Working Pressure (psi)	Connection
11 + 59.46	4"	0-175	Flanged
21 + 56.28	4"	0-175	Flanged

2.8 MANHOLES

- A. Refer to Section 03400

2.9 CONCRETE

- A. Refer to Section 02300

2.10 SOIL MATERIALS

- A. Furnish pipe bedding and cover as specified in Section 02300

2.11 PIPE ACCESSORIES

A. Underground Type Plastic Line Marker

- 1. Manufacturer's standard permanent, continuous-printed plastic tape with metallic core, intended for direct-burial service; not less than 6-inch wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SANITARY SEWAGE LINE BURIED BELOW." Provide identification markers of one of the following:
 - a. Allen Systems, Inc.
 - b. Emed Co., Inc.
 - c. Seton Name Plate Corp.
 - d. Or accepted substitution

B. Tracer Wire for Buried Pipe

- 1. Provide tracer wire for all HDPE pipe and PVC pipe
- 2. All tracer wire shall be 12 AWG solid copper wire coated with 45 mil Type HMW - PE blue insulation compliant with ASTM D1351 specifically designed for direct burial in corrosive soil or water
- 3. UL listed

C. Tracer Wire for Horizontal Directional Drilling

- 1. Non-UL listed tracer wire specifically developed for Horizontal Directional Drilling application
- 2. 1/4-inch 304 Stainless Steel tracer wire
 - a. Performance Wire & Cable Inc.: "Tracer wire, Stranded SS /45 mil HMW-HDPE, 30 Volt, HDD direct bury use only"
- 3. #12 AWG Solid Carbon Clad Steel Extra High Strength tracer wire
 - a. Copperhead Industries, LLC: "Direct Burial #12 AWG Solid (.0808" diameter), 21% conductivity copper-clad hard drawn high carbon steel extra high strength horizontal directional drill tracer wire, 1150# average tensile break load, 45 mil. high molecular weight-high density polyethylene jacket complying with ASTM-D-1248, 30 volt rating"
 - b. Pro-Line Safety Products Co.: "Pro-Trace HDD-CCS PE45"

D. Tracer Wire Test Stations

- 1. 4-inch with locking lid
- 2. Manufacturers:
 - a. CP Test Services
 - b. Glenn Series "Glenn-4"
 - c. Or accepted substitution

E. Corrosion Control

- 1. Rust inhibitive primer:
 - a. Tnemec "Series 77H Chem-Prime"
 - b. Or accepted substitution

2. Rust preventative compound:
 - a. Houghton "Rust Veto 344"
 - b. Rust-Oleum "R-9"
 - c. Or accepted substitution

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine pipe and fittings and do not use individual sections containing cracks, dents, abrasions, and other defects
- B. Inspect pipe and accessories for cracks and other defects before lowering into trench
- C. Repair or replace any defective, damaged or unsound pipe
- D. Remove all dirt and foreign material from the inside of pipe before laying
- E. Check bedding for firmness and uniformity of surface immediately before laying each section of pipe

3.2 INSTALLATION OF HDPE PRESSURE PIPE

- A. Trenching, Pipe Embedment, Backfill, and Compaction: See Section 02300
- B. Pipe and Fittings
 1. Follow pipe manufacturers installation instructions for field cutting and fusion joining techniques for HDPE pipe
 - a. Include acceptable size and shape of fusion bead; and minimum radius of curvature of various sizes of pipe for installing curved sections of pipe
 2. Carefully lower pipe, fittings, valves, and accessories into the trench with derricks, ropes, and other suitable equipment to prevent damage
 3. Do not dump or drop pipe or accessories into trench
 4. Lay to lines and grades indicated on drawings or as specified
 - a. Lay piping beginning at a low point of system, true to line and grade with unbroken continuity of invert.
 - b. Join to form a smooth flow line
 5. Do not install flanges, fittings, or valves in curved sections of pipe
 6. Keep pipe clean during and after laying
 7. Close all open ends with watertight expandable type sewer plugs or test plugs
 8. Do not lay pipe when
 - a. There is water in the trench
 - b. Trench conditions are unsuitable
 - c. Weather conditions are unsuitable
 9. Use acceptable adaptors at manhole and structure connections to provide a watertight seal and flexibility; provide a short length of pipe outside each connection

10. Protect from lateral displacement by placing and compacting bedding material under provisions of Section 02300
11. HDPE pipe by Horizontal Directional Drilling (HDD): Refer to Section 02446

C. Joining

1. Use butt fusion joining technique for connections between pipe sections or fittings unless otherwise noted herein.
2. Butt Fusion
 - a. Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground.
 - b. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations.
 - c. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer.
 - d. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself.
3. Sidewall Fusion
 - a. Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications.
 - b. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused.
 - c. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.
4. Mechanical
 - a. Bolted joining may be used where the butt fusion method cannot be used.
 - b. Flange joining will be accomplished by using a HDPE flange adapter with a ductile iron back-up ring.
 - c. Mechanical joint joining will be accomplished using either a molded mechanical joint adapter or the combination of a Sur-Grip Restrainer and Pipe Stiffener as manufactured by JCM Industries, Inc.
 - d. Either mechanical joint joining method will have a ductile iron mechanical joint gland.
5. Other
 - a. Socket fusion, hot gas fusion, threading, solvents, and epoxies may not be used to join HDPE pipe.

D. Water Line and Sanitary Sewer Crossings

1. Whenever possible lay water mains over sanitary sewers to provide vertical separation of at least 18-inches between invert of water main and crown of sewer.
2. If above separation cannot be met, provide one continuous length of watertight sewer pipe 20 feet long centered on water main with joints between different pipes encased in 6-inch minimum of concrete and extending 6-inches either side of joint or encase sewer pipe in 6-inches of concrete completely around pipe, for not less than 10 feet either side of water main.
3. Water Mains Passing Under Sewers: If vertical separation less than 18-inches provide structural support for sewer

3.3 INSTALLATION OF DUCTILE IRON PIPE

- A. Trenching, Pipe Embedment, Backfill, and Compaction: See Section 02300
- B. Installation of ductile iron pipe and fittings shall be in accordance with AWWA C600
- C. Pipe and Fittings
 - 1. Inspect pipe and accessories for defects before lowering into trench
 - 2. Replace any defective, damaged, or unsound pipe
 - 3. Cutting Pipe
 - a. Cut pipe to measurement taken at the site, not from the drawings
 - b. Cut pipe neatly without damage to pipe or cement lining
 - c. Cut smooth, straight, and at right angles to pipe axis
 - d. Dress and bevel end of cut pipe to remove roughness and sharp corners
 - e. Cut pipe with saw, abrasive wheel or pipe cutter designed specifically for the pipe material
 - 4. Follow pipe manufacturers installation instructions for ductile iron pipe
- D. Mechanical Joints
 - 1. Thoroughly lubricate gaskets and install in accordance with manufacturer's instructions
 - 2. If an effective seal is not obtained, disassemble joint, clean thoroughly, and reassemble
 - 3. Do not over tighten bolts to compensate for poor installation
 - 4. Carefully align holes in mechanical joints with restraint device to permit installation of the harness bolts
 - 5. Install flange and mechanical joint pieces so the mechanical joint holes, as well as the flange holes, straddle the top centerline for horizontal piping, or the side centerline for vertical piping

3.4 INSTALLATION OF PVC GRAVITY SANITARY SEWER PIPE (NON-PRESSURE)

- A. Trenching, Pipe Embedment, Backfill, and Compaction: See Section 02300
- B. Install pipe in accordance with ASTM D2321 as modified herein or on the drawings
- C. Cutting
 - 1. Cut and bevel ends in accordance with manufacturer's standard recommendations
 - 2. Machine cut ends smooth and square to proper dimensions
 - 3. Do not cut with a cold chisel, iron pipe cutter, flame or any other method that may fracture the pipe or leave ragged, uneven edges
 - 4. Remove burrs and wipe off all dust and dirt from jointing surfaces
- D. Pipe Laying
 - 1. Inspect pipe and accessories for cracks and other defects before lowering into trench
 - 2. Repair or replace any defective, damaged or unsound pipe
 - 3. Remove all dirt and foreign material from the inside of pipe before laying

4. Check bedding for firmness and uniformity of surface immediately before laying each section of pipe
5. Carefully lower pipe, fittings, valves, and accessories into the trench with derricks, ropes, and other suitable equipment to prevent damage
6. Do not dump or drop pipe or accessories into trench
7. Lay to lines and grades indicated on drawings or as specified
 - a. Lay piping beginning at a low point of system, true to line and grade with unbroken continuity of invert.
 - b. Closely joint to form a smooth flow line
 - c. Place bell end or groove ends of piping facing upstream
 - d. Maximum length of pipe that can be used without exceeding the allowable deflection at a coupling shall be determined
 - e. Maximum deflection at flexible couplings as recommended by the manufacturer
 - f. Maximum deflection at a joint: As recommended by the manufacturer, but not more than 3-1/2 inches
8. Utilize implements, tools, and facilities as recommended by the manufacturer
9. Keep pipe clean during and after laying
10. Close all open ends with watertight expandable type sewer plugs or test plugs
11. Remove and relay any pipe which has floated
12. Do not lay pipe when
 - a. There is water in the trench
 - b. Trench conditions are unsuitable
 - c. Weather conditions are unsuitable
13. Use acceptable adaptors at manhole and structure connections to provide a watertight seal and flexibility; provide a short length of pipe outside each connection
14. Protect from lateral displacement by placing and compacting bedding material under provisions of Section 02300

E. Jointing

1. Assemble in accordance with the manufacturer's instructions
2. Wipe clean pipe ends, gasket and gasket groove before inserting gasket
3. Apply lubricant furnished by the pipe manufacturer to the gasket and the outside of the spigot end
4. Utilize an assembly tool as recommended by the manufacturer to center the sleeve over the spigot end
5. Insert the spigot end to the reference mark
6. Check gasket location after assembly with a suitable gage
 - a. Gasket locations to be the distance from the sleeve and recommended by the coupling manufacturer for their full circumference
 - b. If not within the required limits, disassemble and reassemble the joint

F. Fittings

1. Install utilizing standard methods
2. Lower into trench with rope or other means to prevent damage
3. Attach rope around the exterior
4. Do not attach rope through the interior
5. Carefully connect to pipe or other facility

6. Check joint to insure a sound and proper joint

G. Water Line and Sanitary Sewer Crossings

1. Whenever possible lay water mains over sanitary sewers to provide vertical separation of at least 18-inches between invert of water main and crown of sewer.
2. If above separation cannot be met, provide one continuous length of watertight sewer pipe 20 feet long centered on water main with joints between different pipes encased in 6-inch minimum of concrete and extending 6-inches either side of joint or encase sewer pipe in 6-inches of concrete completely around pipe, for not less than 10 feet either side of water main.
3. Water Mains Passing Under Sewers: If vertical separation less than 18-inches provide structural support for sewer

3.5 PRECAST STRUCTURE AND MANHOLE

A. Refer to Section 03400

3.6 CONNECTION TO EXISTING MANHOLES

- A. Maintain flow at all times
- B. Prior approval of proposed method for maintaining flow must be obtained from Engineer
- C. Cover area around new pipe with non-shrink grout and or waterstop gasket to ensure a watertight structure
- D. Make connection during low flow periods

3.7 FIELD TESTING

- A. Perform field pressure tests on pressure sewer pipe and connections of 4 inch or smaller
 1. Before Beginning Pressure Test:
 - a. Completely backfill pipe following Section 02300
 - b. Slowly fill section of pipe to be tested with water until completely full and air has been expelled
 - c. Pressurize to allow for diametric expansion or pipe stretching to stabilize
 - d. Add water as necessary until pressure stabilizes at test pressure
 - e. Protect exposed pipe from temperature fluctuation
 2. Conduct pressure testing with Engineer in attendance and give 72 hours notice to Engineer prior to testing
 3. Water meter for testing: furnished by the Contractor
 4. Provide pressure gage recorder capable of printing a continuous record of pressure test readings (by Dickson Pressure Recorders, Model Numbers PW476 or PW875) and charts for testing
 5. Use test pressure minimum of 150 psi at low point of system
 6. Subject test section to test pressure for minimum of 2 hours. Contractor personnel will operate valves during this portion of test under direction of Engineer.
 7. Leakage Allowance

- a. Solvent-cement joint or threaded joint and HDPE pipe with fusion jointing techniques for connections: None allowed
- 8. Should test results show displacement and damage, eliminate leakage and retest until specified conditions are met.
- 9. After approval of test by Engineer open all valves
- B. TV Inspection will be provided as requested by Larimer County and approved by the Engineer at the expense of the Contractor.

3.8 CLEANUP AND RESTORATION

- A. Restore pavements, curbs and gutters, utilities, and other improvements to condition equal to or better than before work began and to satisfaction of Engineer.
- B. Deposit waste material in designated waste areas and disposal site graded and shaped.

END OF SECTION

SECTION 02950

SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Soil preparation
- B. Fertilization
- C. Seeding methods
- D. Areas to be reseeded
- E. Seed Mix
- F. Maintenance
- G. Seed protection and slope stabilization

1.2 RELATED SECTIONS

- A. Division 1
- B. Section 02300 – Earthwork

1.3 REFERENCES

- A. FS O-F-241 – Fertilizers, Mixed, Commercial
- B. American Association of Nurserymen - Standardized Plant Names

1.4 SUBMITTALS

- A. Submit under Division One Specifications
- B. Product Data: Live Seed analyses for grass mixtures not more than 9 months old including percent of live seed, germination, all crop seeds in excess of 1 percent, inerts and weeds

1.5 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging
- B. Provide a certificate of the PLS test of the grass seed intended for the project, certifying that the seed furnished is from a lot that has been tested by a recognized laboratory.

- C. All brands furnished shall be free from such noxious seeds as Russian or Canadian Thistle, Coarse Fescue, European Birdweed, Johnson Grass and Leaf Spurge.

1.6 QUALIFICATIONS

- A. Applicator: Company specializing in performing work of this section with landscaping license from State of Colorado
 - 1. Experienced with type, elevation, topography and scale of work specified
 - 2. Adequate equipment and personnel to perform work

1.7 REGULATORY REQUIREMENTS

- A. Comply with codes and ordinances of local regulatory agencies for fertilizer and herbicide composition and regulations of State of Colorado, the Town of Berthoud, and Larimer County
- B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division One specifications
- B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable
- C. Deliver all commercial fertilizer (18-46-0) mixed in bags of the manufacturer, showing weight, chemical analysis and manufacturer name. Store in such a manner such that its effectiveness will not be impaired

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not prepare or seed frozen soils
- B. Perform seeding and planting only after preceding work establishing final ground surface is completed
- C. Conduct minimum of two (2) soil tests to confirm fertilizer type and application rates

1.10 MAINTENANCE SERVICE

- A. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition

1.11 WARRANTY

- A. All plant material and work accomplished under this section shall be guaranteed to provide a uniform stand of grass acceptable to the Owner at the end of a one (1) year time period from the completion of the Seeding and Erosion Control work

PART 2 PRODUCTS

2.1 SEED SUPPLIERS

- A. Manufacturers:
 - 1. Arkansas Valley Seed Co
 - 2. Or accepted substitution
- B. Provide the latest crop available in accordance with Colorado Department of Agriculture Seed Laws, Chapter 35, Article 27
- C. Compensate for percentage of purity and germination by furnishing sufficient additional seed to equal the specified pure live seed product. The formula for determining the quantity of pure live seed (PLS) shall be:

Pounds of Seed (Bulk) X Purity X Germination = Pounds of Pure Live Seed (PLS)

2.2 SEED MIX

- A. Standard Mix Per Table Below:

Species	Scientific Name	% of mix	lb/ac, PLS
Buffalograss	<i>Buchloe dactyloides</i>	44.4	8.4
Western wheatgrass	<i>Pascopyrum smithii</i>	22.8	4.3
Slender wheatgrass	<i>Elymus trachycaulus</i>	15.9	3.0
Sideoats grama	<i>Bouteloua curtipendula</i>	13.2	2.5
Blue grama	<i>Bouteloua gracilis</i>	3.2	0.6
Sand dropseed	<i>Sporobolus cryptandrus</i>	0.5	0.1

Seeding rate = 18.9 lb/ac, PLS

- B. Representative Species Per Table Below:

Species	Scientific Name	Seeds per pound
Slender wheatgrass	<i>Elymus trachycaulus</i>	159,000
Western wheatgrass	<i>Pascopyrum smithii</i>	110,000
Buffalograss	<i>Buchloe dactyloides</i>	825,000
Sideoats grama	<i>Bouteloua curtipendula</i>	56,000
Blue grama	<i>Bouteloua gracilis</i>	191,000
Little bluestem	<i>Schizachyrium scoparium</i>	260,000
Sand bluestem	<i>Andropogon hallii</i>	113,000
Sand dropseed	<i>Sporobolus cryptandrus</i>	5,298,000
Green needlegrass	<i>Stipa viridula</i>	181,000
Alkali sacaton*	<i>Sporobolus airoides</i>	1,758,000
Inland saltgrass*	<i>Distichlis stricta</i>	520,000
Switchgrass*	<i>Panicum virgatum</i>	389,000

*Species adapted to wet, alkaline habitat

2.3 SOIL MATERIALS

- A. Select onsite topsoil: Earth material of loose friable clay loam reasonably free of admixtures of subsoil, refuse stumps, roots, rocks, brush, weeds or other material which can be detrimental to the proper development of site revegetation

2.4 ACCESSORIES

- A. Soil Additives (Fertilizer)
 - 1. Dry fertilizers: Primary element composition by weight of 6-10-5
 - a. Nitrogen (N) six (6%) percent of which fifty (50%) percent inorganic, phosphoric acid (P_2O_5) ten (10%) percent, and potash (K_2O) five (5%) percent
 - 2. Commercial fertilizer: Primary element composition by weight of 18-46-0
 - a. Nitrogen, eighteen (18%) percent, of which fifty (50%) percent is organic, and phosphoric acid (P_2O_5), forty-six (46%) percent
 - b. These elements may be organic, inorganic, or a combination and shall be available according to the methods adopted by the Association of Official Chemists
 - 3. Dry, pelletized or granular, uniform in composition and a free flowing product. Do not use material which has caked, segregated, exceeded the expiration date of application, or be otherwise damaged
 - 4. Thoroughly mixed by the manufacturer. Clearly identify the contents of each container. Do not use materials and containers previously opened, exceeding the expiration date for application or otherwise damaged
- B. Erosion Control Fabric: Straw and/or coconut fiber combination blanket for temporary protection of steeply sloped areas
 - 1. Sloped areas 6:1 and steeper
 - 2. SC150 by North American Green
 - 3. S2 by Bon Terra American
- C. Silt fences used for erosion control barriers: Refer to Section 02300
- D. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass
- E. Mulching Material: Straw or onsite grasses from grubbing operation, dry, free from foreign matter detrimental to plant life

PART 3 EXECUTION

3.1 GENERAL

- A. Seed all areas disturbed by construction, including all areas along the roadside ditches
- B. Pattern for seeding and fertilization as required by field conditions. In no case shall revegetation occur within 30 days of the application of any chemical weed control substance

- C. Engineer to review grading prior to seeding

3.2 SOIL PREPARATION

- A. Uniformly place and spread topsoil removed during grubbing and stored on site. Provide minimum thickness of 4 inches to meet finished grade. Key topsoil to the underlying and surrounding material by the use of harrows, rollers or other equipment suitable for the purpose
- B. Apply water to the topsoil for compaction purposes in a fine spray by nozzles in such a manner that it will not wash or erode the newly placed soil
- C. Exercise care during soil preparation on all embankments so as not to disturb established ground cover. Areas disturbed during the soil preparation will be fertilized and seeded at the discretion of the Engineer in accordance with these documents

3.3 FERTILIZATION

- A. Do not proceed with fertilization in adverse weather and unsuitable ground conditions. Examples of these respective conditions may be wind, precipitation, frozen and untillable ground or conditions detrimental to the effectiveness of the application
- B. Apply fertilizer in a manner to assure uniform distribution, light watering is acceptable for dispersion
- C. In cases where work progress is stopped due to the above conditions, fertilization will begin again, when appropriate conditions exist. The application will begin again with a reasonable overlapping of the previously applied area

3.4 SEEDING METHODS

- A. All seeding shall be installed by drilling method only. Small areas of restoration may be broadcast seeded if directed by Engineer
- B. Do not proceed with seeding in adverse weather and unsuitable ground conditions. Examples of these respective conditions may be wind, precipitation, frozen or untillable ground or conditions detrimental to the effectiveness of the application. All seeding shall be performed between either March 1st to May 30th of the calendar year of construction unless indicated otherwise by Engineer
- C. Drilling:
 - 1. Accomplish seeding by means of an approved power drawn drill, followed by drag chains. The grass drill should be equipped with a satisfactory feeding mechanism, agitation, and double disk furrow openers. Equip drills with depth bands set to maintain a planting depth of approximately 3 to 2 inch and shall be set to space rows not more than 7 inches apart
 - 2. If inspections indicate that strips wider than the specified space between the rows planted have been left or other areas skipped, the Engineer will require immediate

- resowing of seed in such areas at the Contractor's expense. The seeding mixture shown in the Materials Section applies at a pure live seed rate per acre
3. Immediately following seeding apply straw mulch at a rate of one (1) ton per acre
 4. Apply water with a fine spray immediately after each area has been mulched. Saturate to four (4) inches of soil depth
 5. Provide additional watering weekly until revegetation seed has germinated

3.5 AREAS TO BE RESEEDED

- A. Seed all disturbed areas
- B. Additional areas as requested by the Owner and approved by the Engineer

3.6 MAINTENANCE

- A. Fertilize the seeded areas once a uniform stand of grass has been established
- B. Maintain seeded areas until there is an acceptable uniform plant growth. Reseed areas that are not producing a uniform plant growth within five (5) weeks following seeding. Acceptable uniform plant growth shall be defined as that time when the scattered bare spots, not greater than 1 square foot in area, do not exceed three percent (3%) of the seeded area
- C. Maintenance period - 1 year
- D. Areas that are seeded late in the fall planting season which are not producing acceptable uniform plant growth, as described above, shall be reseeded during the following spring planting season. If such a condition exists, and the Contractor has diligently, in the opinion of the Engineer, pursued the performance of his work, the Owner at his option, may extend the contract completion date and reduce contract retainage. Retainage may be reduced to less than five percent (5%) of the total contract amount, but shall be at least two (2) times the estimated cost of obtaining the required growth in the indicated areas, plus areas which are susceptible to damage by winter kill, washout or other causes
- E. Contractor shall control perennial weeds, thistle, spotted and napweed, spurge and other weeds during the maintenance period

3.7 SEED PROTECTION AND SLOPE STABILIZATION

- A. Cover seeded slopes with erosion control fabric where grade is 3 to 1 or greater and where indicated on the Drawings and/or Section 02300. Cover seed with mulch in all other areas
- B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 6 inch overlap minimum of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil
- C. Secure outside edges and overlaps at 48 inch intervals with 4-inch to 6-inch U-shaped type pins or wooden stakes depending on ground condition

- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil
- E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches
- F. Maintain integrity of erosion control fabric until seed germination. If seed is washed out before germination, fertilize, reseed and restore affected areas

END OF SECTION

SECTION 03400
PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. All precast vaults including precast inlets and manholes complete with steps, ring and cover as required
- B. All other necessary appurtenances

1.2 RELATED SECTIONS

- A. Section 01020 – Geotechnical Report
- B. Section 02300 - Earthwork
- C. Section 03600 – Grout

1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM)
 - 1. A48 – Gray Iron Castings
 - 2. A185 – Welded Steel Wire Fabric for Concrete Reinforcement
 - 3. A615 – Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - 4. C33 – Concrete Aggregates
 - 5. C150 – Portland Cement
 - 6. C478 – Precast Reinforced Concrete Manhole Sections
 - 7. C789 – Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers
 - 8. C923 – Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
 - 9. D2240 – Test Method from Rubber Property-Durometer Hardness

1.4 SUBMITTALS

- A. Submit under provisions of Division 1 Specifications
- B. Shop Drawings: Provide sufficient data to verify compliance with the specifications and to illustrate construction and assembly
- C. Product Data: Provide manufacturer catalog information on castings, grating, and accessories to indicate compliance with specifications
- D. Design Data: Include calculations prepared by precast manufacturer indicating design loads and material requirements for reinforcement

1.5 DELIVERY, STORAGE AND HANDLING

- A. Transport and handle precast concrete units with equipment to protect from dirt and damage
- B. Do not place units in position which will cause damage
- C. Handle by means of lifting inserts
- D. Do not move from manufacturer's yard until curing is complete

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Colorado Precast
- B. Amcor Precast
- C. Front Range Precast (FLXX)
- D. Oldcastle Precast
- E. Or approved substitution

2.2 MATERIALS

- A. Reinforcement
 - 1. Reinforcing Steel: ASTM A615 Grade 60
 - 2. Welded Wire Fabric: ASTM A185
- B. Concrete
 - 1. Minimum compressive strength: 4500 psi at 28 days
 - 2. Cement: ASTM C150, Portland Cement, Type II
 - 3. Aggregates: ASTM C33, free of deleterious substances
- C. Precast Sections
 - 1. Specification: ASTM C478
 - 2. Minimum wall thickness: 6 inch
 - 3. Grade rings as required
- D. Gaskets: ASTM C923
 - 1. Mastic: FS SS-S-210A, "RAM-NEK" or approved substitution
 - 2. Rubber: Neoprene, 40 \pm 5 hardness when measured by ASTM D2240, Type A durometer
- E. Castings: ASTM A48 with asphalt varnish coating hot dip applied at foundry, 6 mils thick

- F. Manhole Rings and Covers
 - 1. Cast iron, heavy duty traffic type, ASTM A48, Class 30B. Grind bearing surfaces to ensure flat, true surfaces
 - 2. Covers to seat at all points on ring
 - 3. Covers to be cast with "SANITARY" in 2" tall flush letters
 - 4. Provide type as indicated on the drawings
- G. Manhole Steps: Steel bar, 1/2 inch Grade 60, drop-front type, with polypropylene coating applied by manufacturer, Type MA Industries, Inc. "PS2-PF" or accepted substitution
- H. Manhole Height Adjustment: Use precast concrete grade rings
- I. Rock Subbase: 12 inches minimum of 1-1/2 inch minus, well-graded gravel over compacted subgrade
- J. Water: Clean and free of deleterious substances
- K. Grout
 - 1. Refer to Section 03600

2.3 FABRICATION

- A. Vault/Manhole Sections
 - 1. Precast concrete dimensions as shown on plans
 - 2. Minimum manhole inside diameter: 48 inch
 - 3. Precast lid: Same or greater reinforcement and wall thickness as vault or manhole section with capability for HS20 loading
 - 4. Joints: Shiplap or tongue and groove with double mastic gaskets, each joint to set equally and tightly
 - 5. Manhole Joints: Keylock type with double mastic gaskets, each joint to set equally and tightly
 - 6. Access opening: Minimum 24 clear or as indicated
 - 7. Pipe connection: As indicated on Drawings
 - 8. Pipe knockout: As indicated on Drawings
 - 9. Precast concrete, monolithic base
 - 10. Manhole steps: 12 inch on center, vertical alignment above largest bench or open area

2.4 MANHOLES

- A. Design:
 - 1. Precast concrete manholes: ASTM C478
 - 2. Use concrete that will attain a 28-day compressive strength of not less than 4,000 psi with a cement content of not less than 6 sacks per cu. yd
 - 3. Minimum wall thickness: greater of 6 inch 1/12 of internal diameter
 - 4. Reinforced
 - 5. Grade rings as required
 - 6. Cast steps into units

- B. Manufacturers:
 - 1. Carder Concrete Products
 - 2. Amcor Precast,
 - 3. Old Castle Precast
 - 4. FLXX, Inc.
 - 5. Or approved substitution

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located
- B. Verify that built-in items are in proper location, ready for roughing into Work
- C. Verify excavation for vault is correct

3.2 PREPARATION

- A. Excavation, Backfill, and Subgrade Compaction: Refer to Section 02300
- B. Rock Subbase
 - 1. Remove water and place 6 inch minimum depth
 - 2. Vibrate for compaction
 - 3. Level top to accept precast sections with uniform bearing all around
 - 4. If material below vault is unsuitable, excavate as directed by the Engineer and backfill to grade with 1-1/2 inch minus rock and compact

3.3 PLACING PRECAST SECTIONS

- A. Install in accordance with ASTM C478
- B. Thoroughly clean joints of sections to place gasket material
- C. Place gasket material on base or lower section to ensure watertight fit between lower precast section and upper precast section
- D. Fill inside and outside of joint completely with non-shrink grout and trowel smooth
- E. Cure non-shrink grout using approved methods outlined in Section 03600 and as recommended by manufacturer
- F. Remove and replace vault sections which have chipped or cracked joints
- G. Thoroughly clean section joints

3.4 PREFORMED GASKETS

- A. Install gasket in conformance with manufacturer's recommendations

- B. Only use primer furnished by gasket manufacturer

3.5 MANHOLE RING AND COVER

- A. Place ring in bed of non-shrink grout on top of vault
- B. Carry non-shrink grout over flange of ring
- C. Set top of ring flush with all surfaces subject to foot and vehicular traffic
- D. Use precast grade rings for height adjustment

3.6 HATCHES

- A. Use Bilco hatch where indicated on drawings
- B. Install hatch according to manufacturer's published recommendation

3.7 SCHEDULE

A. Precast Vault/Manhole

Type	Station	Pipe Penetration Size	Grade Elevation (ft)	Bottom of Footing Elevation (ft)	Manhole Size
Valve Vault	10 + 42.95	4"	4990.00	4981.20	N/A
AR/VB Vault	16 + 52.74	4"	4984.76	4978.41	4'
AR/VB Vault	58 + 14.11	4"	5044.57	5038.9	4'
Manhole	69 + 26.57	8"	4987.14	4980.10	4'

END OF SECTION

SECTION 03600

GROUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Patching cavities in concrete
- B. Grout precast vaults
- C. Other grouting specified or indicated on drawings

1.2 RELATED SECTIONS

- A. Section 03400 – Precast Concrete Structures

1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM)
 - 1. C109 – Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
 - 2. C157 – Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete
 - 3. C191 – Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle

1.4 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Product Data: Provide manufacturer's catalog sheet for material indicating test data and physical properties

1.5 QUALITY ASSURANCE

- A. Conform to applicable industry standard, Corps of Engineers, Specification CRD-C 621 - Specification for non-shrink grout

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Non-Shrink, Non-Metallic Grout
 - 1. Master Builders - Masterflow 928
 - 2. Burke - Non-Ferrous Non-Shrink
 - 3. M.R. Meadows - Sealtight 588
 - 4. Sonneborn - Sonogrout G.P.

5. Tamms - TammsgROUT 621
6. Sika - SikaGrout 212
7. Or accepted substitution

B. Epoxy Grout

1. Burke - BurkEpoxy Anchoring Grout
2. L&M Inc. - EpogROUT
3. Sika - Sikadur 42, Grout Pack
4. Or approved equal

2.2 MATERIALS

- A. Non-Shrink, Non-Metallic Grout: Factory premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 4,000 psi in one day and 8,000 psi in 7 days
- B. Epoxy Grout: Three Component Epoxy Resin System
1. Two liquid epoxy components
 2. One inert aggregate filtered component
 3. Each component furnished in separate package for mixing at job site
- C. Water: Clean and free from deleterious substances

PART 3 EXECUTION

3.1 PREPARATION

- A. Non-Shrink, Non-Metallic Grout
1. Clean concrete surface to receive grout
 2. Saturate concrete with water for 24 hrs prior to grouting and remove excess water just prior to placing grout
 3. Cold weather conditions
 - a. Warm concrete, substrate and base plate to 40 deg F, or above; store grout in warm area
 - b. Follow manufacturer's recommendations for cold weather application
 4. Hot weather conditions
 - a. Use cold mixing water and cool base plate if possible; store grout in cool area
 - b. Follow manufacturer's recommendations for hot weather application
 5. Apply to clean, sound surface
 6. Apply latex bonding agent to hardened concrete, mix-in-grout, or as directed by Engineer
- B. Epoxy Grout: Apply only to clean, dry, sound surface

3.2 APPLICATION

- A. Non-Shrink, Non-Metallic Grout
1. Mix in a mechanical mixer

2. Use no more water than necessary to produce flowable grout
3. Provide air vents where necessary to eliminate air pockets
4. Place in accordance with manufacturer's instructions
5. Where exposed to view finish grout edges smooth
6. Protect against rapid moisture loss by immediately covering with wet rags and polyethylene sheets or curing compound
7. Wet cure grout for 7 days, minimum
8. Maintain the temperature at a minimum of 40 deg F until grout reaches 3,000 psi
9. After placement of grout, eliminate excessive external vibration

B. Epoxy Grout

1. Mix and place in accordance with manufacturer's instructions
2. Completely fill all cavities and spaces around dowels and anchors without voids
3. Obtain manufacturer's technical assistance as required to insure proper placement

3.3 SCHEDULE

A. Non-Shrink, Non-Metallic Grout: General Use

1. Grouting of manholes inlets and vaults

B. Epoxy Grout

1. Patching cavities in concrete including, but not limited to, tie holes, and structural and equipment support

END OF SECTION

SECTION 11306

DUPLEX SUBMERSIBLE GRINDER PUMP STATION

PART 1 GENERAL

1.1 SUMMARY

- A. The contractor shall provide all materials, equipment and labor necessary to install, test and place into service the duplex pumping system as shown on the Drawings and as specified herein.
- B. Manufacturer to provide two (2) sewage grinder pumps, two (2) float level control switches, a level transmitter, discharge plumbing with disconnects, lifting chains, two (2) check valves, two (2) plug valves, and a NEMA 3R remote mounted control panel
- C. The system shall be by the same manufacturer as supplying the pump and motor control panel so as to insure suitability and assurance of experience in matching the equipment together and to insure single source responsibility for the equipment.

1.2 REFERENCES

- A. ASTM – American Society of Testing and Materials
- B. ANSI – American National Standards Institute
- C. NEC – National Electrical Code
- D. U.L – Underwriters Laboratories

1.3 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01730
- B. Operation Data: Include manufacturer's instructions, description of system operation, start-up data and trouble-shooting check lists, and repair data for grinder pump station and ancillary equipment
- C. Maintenance Data: Include manufacturer's literature, cleaning procedures, replacement parts list, wiring diagrams, and repair data for pump components

1.4 DELIVERY, STORAGE, AND HANDLING

- A. In accordance with Section 01600

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hydromatic Pump Company: Model HPGHH750M3-2
- B. Or accepted substitution

2.2 PERFORMANCE REQUIREMENTS

- A. General
 - 1. The duplex grinder pump station package shall be capable of handling unscreened sewage in accordance with the design conditions defined in this specification.
- B. Grinder Pump Design Requirements
 - 1. Number of Pumping Units: Two (2)
 - 2. Pump Design Point: 80 GPM at 110 feet total dynamic head
 - 3. Minimum Discharge Size: 2-inch (NPT)
 - 4. Electrical Service Characteristics: 480V, 3 phase, 60-Hz
 - 5. Motor Rated Horsepower: 7.5 hp
 - 6. Pump Operating Speed: 3450 RPM
 - 7. Stainless Steel Lifting Chain: 20 feet of 316 SST for each pump

2.3 PUMP CONSTRUCTION

- A. Each pump shall be of the sealed submersible type. The pump volute, motor and seal housing shall be high quality gray cast iron, ASTM A-48, Class 25. All external mating parts shall be machined and Buna N Rubber. O-ring sealed on a beveled edge. Gaskets shall not be acceptable. All fasteners exposed to the pumped liquids shall be 300 Series stainless steel.
- B. The pump and motor shall be specifically designed so that they may be operated partially dry or completely submerged in liquid being pumped
 - 1. Waterjackets for cooling are not acceptable
- C. The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two stainless steel guide pipes extending from the top of the station to the discharge connection. No portion of the pump shall bear directly on the sump floor
 - 1. Sealing of the pump unit to the discharge connection shall be accomplished by a machined metal to metal water tight contact
 - a. Diaphragm, O-ring or profile gasket will not be acceptable
- D. Pump shall be equipped with a heat sensor
 - 1. Type: low resistance, bi-metal disc, temperature sensitive
 - 2. Mounted directly in the stator
 - 3. Sized to open at 120°C or 130°C and automatically reset at 30°- 35°C differential

4. Sensor connected in series with the motor starter coil. Stator is tripped as a heat sensor opens
 5. The motor starter shall be equipped with overload heaters so all normal overloads are protected by external heater block
- E. The pump shall be equipped with a seal leak detection probe and warning system.
- F. Seals and bearing shall be locally available
- G. No special tools shall be required for pump and motor disassembly
- H. Seals:
1. The pump shall have two mechanical seals, mounted in tandem, with an oil chamber between the seals.
 - a. Seal failure device (electric probe or sensor) provided in the seal chamber between mechanical seals. If the lower seal fails, contaminants which enter the seal chamber shall be detected by the sensor and send a signal to operate the specified warning device.
 2. The lower seal shall be replaceable without disassembly of the seal chamber and without the use of special tools.
 3. John Crane type seals shall be used
 4. Rotating seal faces: carbon
 5. Stationary seal faces: ceramic
 6. Seals shall be locally available
 7. The following seal parameters shall not be accepted
 - a. Tungsten-carbide seals or foreign manufactured seals
 - b. Seal combination using an opposing spring
- I. Bearings and Shaft
1. Provide with an upper radial bearing and a low thrust bearing
 2. Bearings shall be permanently lubricated by the dielectric oil which fills the motor housing
 3. The following bearing conditions will not be acceptable
 - a. Sealed grease packed bearings
 - b. Bearings which require lubrication according to a prescribed schedule
 - c. Units which require the use of more than two bearings shall not be acceptable
 4. Shaft
 5. Machined from a solid 416 stainless steel
 6. Design: large diameter with a minimum overhang to reduce shaft deflection and prolong bearing life
- J. Impeller
1. Bronze construction and non-overloading
 2. Multi-vane, semi-open design with pump-out vanes on the backside of the impeller to prevent grit and other materials from collecting in the seal area.
 3. Impeller shall not require coating.

4. Hydraulically and statically balanced. The tolerance values shall be as listed below according to the International Standard Organization grade 6.3 for rotors in rigid frames. The tolerance is to be split equally between the two balance planes which are the impeller shrouds.

RPM	TOLERANCE
3450	.01 in. - oz./lb. of impeller weight

K. Grinder Cutters

1. The grinder shall be capable of grinding all materials found in normal domestic sewage, including plastics, rubber, sanitary napkins, disposable diapers, and wooden articles into a finely ground slurry with particle dimensions no greater than 1/4 inch.
2. The grinder unit shall be on the suction side of the pump impeller and discharge directly into the impeller inlet leaving no exposed shaft to permit packing of ground solids.
3. The combination centrifugal pump impeller and grinder unit shall be attached to the common motor and pump shaft made of 416 stainless steel.
4. Provide two stage grinder
 - a. Cutting action of the second stage shall be perpendicular to the plane of the first cut for better control of the particle size.
 - b. Both stationary and rotating cutters shall be made of 440C stainless steel hardened to Rockwell 60C and ground to close tolerance.
 - c. The upper (axial) cutter and stationary cutter ring shall be reversible to provide new cutting edges to double life.
 - i) Suppliers furnishing pumps with grinders which cannot be reversed for double wear shall be required to furnish a spare set of grinders for each pump.
 - d. The stationary cutter ring shall be pressed into the suction opening of the volute and held in place by three (3) 300 Series stainless steel screws.
 - e. Lower (radial) cutter:
 - i) Action: macerate the solids against the I.D. of the cutter ring and extrude them through the slots of the cutter ring
 - ii) Shall be slip fit and secured by means of peg and hold
 - iii) Shall rotate simultaneously with the rotation of the shaft and impeller
 - f. Upper (axial) cutter:
 - g. Action: cut off the extrusions, as they emerge from the slots of the cutter ring
 - h. Shall fit over the hub of the impeller
5. The grinding mechanism shall be locked to the shaft by a 300 Series stainless steel countersunk washer in conjunction with a 300 Series stainless steel flat head cap screw threaded into the end of the shaft

2.4 MOTORS

A. General

1. Stator, motor, and bearings shall be mounted in a sealed submersible type housing
2. The motor and the pump shall be produced by the same manufacturer
3. Shall be 230 volt, 3 phase, 60-Hz, three wire service

4. Shall include with 50 feet of submersible cable (SUBCAB), suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and have P-MSHA Approval.
5. Dielectric oil filled motor, NEMA B design, oil cooled induction type
6. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

B. Stator

1. The stator windings: Class F insulation (155°C or 311°F)
2. Stators shall be securely held in place with a removable end ring and threaded fasteners so they may be easily removed in the field without the use of heat or a press.
3. Stators must be capable of being repaired or rewound by local motor service station.

C. Electrical Power Cord

1. Electrical power cord shall be water resistant 600 volt, 60oC, UL and or CSA approved and applied dependent on amp draw for size.
2. The pump shall be protected with compression fitting and epoxy potted area at the power cord entry to the pump.
 - a. Separation between the junction box areas of the pump and the motor by a stator lead sealing gland or terminal board shall not be acceptable.
3. Power Cable Entry
 - a. Entry into the cord cap assembly made first with a compression fitting
 - b. Each individual lead shall be stripped down to bare wire, at staged intervals, and each strand shall be individually separated. This area of the cord cap shall then be filled with an epoxy compound potting
 - c. The power cord leads shall then be connected to the motor leads with extra heavy connectors having brass inserts with screwed wire to wire connections,
 - i) A terminal board will not be accepted
 - d. The cord gap assembly where bolted to the connection box assembly shall be sealed with a Buna N Rubber O-ring on a beveled edge to assure proper sealing

D. Service Factor

1. The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15.
2. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C.
3. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

E. Motor Protection

1. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.
2. A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of

water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote.

3. Use of Voltage sensitive solid state sensors and trip temperature above 125°C (260°F) shall NOT be allowed.
4. The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS monitoring unit shall be designed to be mounted in any control panel.

2.5 FACTORY FINISH

- A. Manufacturer's standard epoxy coating system for continuous submergence in corrosive water

2.6 LIFT-OUT RAIL SYSTEM

- A. The lift-out rail system shall consist of the following equipment:
 1. Bottom rail supports
 2. Upper rail supports
 3. Stainless steel lifting chains, for each pump
- B. Rails shall be constructed of minimum 1-1/2" stainless steel pipe
 1. 2 rails per pump shall be supplied.
 2. Pump Guide Systems that put a downward stress on the lift station cover (top) shall not be acceptable.

2.7 PIPING AND VALVES

- A. The packaged pump system shall be furnished complete with discharge pipes, fittings, check valves and shut-off valves.
- B. Discharge piping:
 1. Schedule 40 Stainless Steel: 2 inch
- C. Check Valves:
 1. Two (2) ball type, 2-inch
 2. Cast-iron ANSI Class 125 flanged
- D. Shut off valves:
 1. Two (2) ¼-turn eccentric plug-type, 2-inch
 2. Cast-iron ANSI Class 125 flanged, with 100% port area
 3. Suitable for the intended purpose

2.8 PUMP CONTROL PANEL

- A. The control panel shall be a wall mounted panel to be installed in the lift station building
- B. The panel shall be contained within a NEMA 3R enclosure constructed of galvanized steel and painted with gray enamel.

- C. Panel shall include for each pump:
 - 1. H-O-A switch
 - 2. Run light
 - 3. Elapsed time meter
 - 4. Seal fail light
 - 5. Circuit breaker
 - 6. Starter (NEMA rated)
 - 7. Overload block
- D. Panel shall contain
 - 1. Alternator
 - 2. Control circuit breaker
 - 3. Flashing red alarm beacon
 - 4. Fusible disconnect
 - 5. Two (2) 12 volt ac level control relays and terminal strips
 - 6. Digital display of the wetwell level with operator adjustable setpoints for starting and stopping the pumps
- E. Power and control cords shall be sealed at the entry point to the disconnect switches that shall be located at the wetwell.
- F. The pumps will be controlled by a digital display unit that will allow an operator to adjust the start and stop levels of the pumps and will receive its signal from a level transmitter in the wetwell. There will also be 2 float switches in the wetwell, one for an high level alarm and one for a low level alarm.
- G. The relays will power the switches with 12 volts AC, so the system is intrinsically safe.
- H. The switches work by conductivity, and the relays have a sensitivity adjustment which is used in difficult applications, such as build up of a grease.
 - 1. Mercury is not required in the operation of these switches.
 - 2. No mercury will be allowed in the wetwell.

2.9 ELECTRICAL CONTROLS

- A. Refer to Division 16 Specifications for enclosure and level control wiring.

2.10 MANUFACTURER'S FIELD SERVICES

- A. Provide under provisions of Sections 01400 and 01700
- B. Prior to start-up:
 - 1. Test all valves, switches, gates and gages for proper settings an operation
 - 2. Check completion of all electrical connections
 - 3. Check assembly alignment
 - 4. Check to ensure all rotational parts are properly lubricated
 - 5. Bump motors to check direction or rotation
 - 6. Direct Contractor in necessarily corrections for start-up

7. Provide written approval for start-up when system is satisfactory

2.11 SYSTEM INSPECTION AND START-UP

- A. Start-up shall be in accordance with Section 01650
- B. Contractor shall refrain from any equipment start-up prior to Manufacturer's inspection
- C. Contractor to coordinate all Manufacturer's field services with Owner and Engineer
- D. Contractor shall notify the Owner, Engineer, and Manufacturer upon completion of installation or readiness of equipment for testing and inspection a minimum of 10 days prior
- E. Contractor shall perform any necessary correction identified by Manufacturer, Owner, or Engineer after inspection and prior to start-up
- F. After installation, a pump station start-up shall be performed by the installing contractor under the supervision of the manufacture's authorized representative.
- G. Manufacturer shall provide One (1) day of field service. Representative shall be an authorized, factory trained representative of the pump manufacturer.
- H. Services shall include, but not be limited to, inspection of the completed pump station installation to ensure that it has been performed in accordance with the manufacturer's instructions and recommendations, supervision of all field-testing and activation of the Pump Manufacturer's Warranty.
- I. The test shall demonstrate to the satisfaction of the Owner that the equipment meets all specified performance criteria, is properly installed and anchored, and operates smoothly without exceeding the full load amperage rating of the motor.

2.12 PUMP FACTORY TESTS

- A. Each completed and assembled pump/motor unit shall undergo the following factory tests at the manufacturer's plant prior to shipment:
 - 1. Minimum 3-point hydraulic performance test
 - 2. No-leak seal integrity test
 - 3. Electrical integrity test
- B. Performance data submitted shall be based on performance with an uncoated impeller. Attempts to improve efficiency by coating impeller shall not acceptable.
- C. Test logs shall be submitted to Engineer and Owner upon completion of each test

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes basic electrical requirements for materials and methods applicable to electrical equipment specified under this section and other related sections.
 - 1. Conduit
 - 2. Boxes
 - 3. Duct Bank
 - 4. Wire and Cable
 - 5. Wiring Devices and Device Plates
 - 6. Maintenance Materials
 - 7. Grounding Materials
 - 8. Power Panels
- B. Related Sections:
 - 1. Shop Drawings – Section 01340
 - 2. Temporary Facilities – Section 01500
 - 3. Materials and Equipment – Section 01600
 - 4. Operation & Maintenance Data – Section 01730
 - 5. Earthwork – Section 02300
 - 6. Concrete – Section 03000
 - 7. Painting – Section 09900

1.2 REFERENCES

- A. UL – All applicable standards
- B. IEEE – All applicable standards
- C. IPCEA – All applicable standards
- D. NEMA – All applicable standards
- E. ANSI/NFPA 70 – National Electrical Code
- F. ANSI C2 – National Electrical Safety Code
- G. ANSI/NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies
- H. ANSI/NEMA OS 1 – Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports
- I. ANSI/NEMA OS 2 – Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

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

1.3 SUBMITTALS

- A. Information covering all material that is to be used on this project shall be submitted.
- B. Each sheet of descriptive literature shall be clearly marked to identify the material or equipment for which it pertains.
- C. Equipment on submitted sheets that is not for this project shall be crossed out.
- D. As a minimum the following information shall be submitted:
 - 1. Lamp fixture descriptive sheets identified by the fixture schedule letter
 - 2. Equipment sheets shall identify what the equipment refers to by calling out the name of the equipment on the sheet.
 - 3. Schematics and connection diagrams for all electrical equipment shall be submitted.
 - 4. Submit all types of conduit and cables with manufacturer and sizes as well as all appurtenances.

1.4 QUALITY ASSURANCE

- A. Supplier's qualifications
 - 1. The entire system shall be designed, coordinated, and supplied by a qualified Electrical Contractor who is regularly engaged in the business of building electrical systems for water and wastewater projects. The Electrical Contractor shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.
- B. Coordination
 - 1. The electrical equipment shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment.
 - 2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
 - 3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.
 - 4. All service entrance work shall be in accordance with the local utility standards.
 - 5. The electrical contractor shall coordinate all service entrance work with the local utility. The local utility is Xcel Energy.
 - 6. The electrical contractor shall NOT pay for the utility's work. That shall be billed directly to the owner.
 - 7. Accurately record actual locations of conduit, duct banks, panels, and accessories.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable Building Code.
- B. Electrical: Conform to NFPA 70.
- C. Coordinate, obtain and pay for all permits, inspections and approvals of authority having jurisdiction.
- D. Comply with local electrical codes in force or in the absence of local electrical code, the latest edition of the National Electrical Code, ANSI C1.

1.6 WARRANTY

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

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. The work for this project is at a functioning wastewater treatment plant. All new work shall be done in a way that allows the existing plant to maintain its operation.
- B. All equipment furnished under this Section shall be selected by the Contractor for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged, and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
 - 1. Conduit
 - a. Minimum Size: $\frac{3}{4}$ inch unless otherwise specified, or $\frac{1}{2}$ inch for luminaries pendants.
 - b. Underground Installations:
 - i) Use thick wall nonmetallic conduit.
 - ii) Minimum size: 1 inch.
 - c. Outdoor Locations, Above Grade: Use rigid steel conduit.
 - d. In building:
 - i) Use electrical metallic tubing.
 - e. Rigid Steel Conduit.
 - i) Rigid steel conduit shall be heavy wall, hot-dipped galvanized, and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
 - f. Rigid Nonmetallic Conduit (PVC).
 - i) PVC conduit shall be heavy wall, schedule 40, shall be UL labeled for aboveground and underground uses.
 - g. PVC-Coated Rigid Steel Conduit.

- i) The conduit shall be rigid steel and before the PVC coating is applied, the hot-dipped galvanized surfaces shall be coated with a primer to ensure a bond between the steel substrate and the coating. The PVC coating shall be bonded to the primed outer surface of the conduit at a thickness of at least 40 mils. A two part urethane chemically cured coating shall be applied at a nominal 2 mil thickness to the interior of all conduit and fittings.
 - ii) Manufacturers: Ocal, PermaCote, or Robroy Industries.
 - h. Rigid Aluminum Conduit.
 - i) Rigid aluminum conduit shall be heavy wall and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
 - i. Flexible connections
 - i) Conduit: Moisture proof vinyl jacketed, liquid-tight, hot-dipped galvanized flexible steel and shall be UL labeled.
 - ii) Connectors: Watertight, Appleton Type ST or STB, Crouse-Hinds Type LT or LTC, or equal.
- 2. Outlet Boxes
 - a. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, Galvanized.
 - i) Luminaries and equipment supporting boxes: rated for weight of equipment supported.
 - ii) Concealed installations.
 - b. Nonmetallic outlet boxes: ANSI/NEMA OS 2.
 - c. Cast Boxes: NEMA FB 1, Type FD, Cast Ferroalloy.
 - i) Provide gasketed cover by box manufacturer.
 - ii) Provide threaded hubs.
 - iii) Models VXF, GRFX as manufactured by Crouse-Hinds.
 - iv) Models SEH, JBDX, with mounting lugs as manufactured by Appleton.
- 3. Pull and Junction
 - a. Sheet Metal Boxes: NEMA OS 1, Galvanized Steel.
 - b. Surface-Mounted Cast Metal Box: NEMA 250, Type 4 flat-flanged, surface-mounted junction box.
 - i) Material: Galvanized cast iron Cast aluminum in corrosive areas.
 - ii) Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
 - iii) Model: WCB as manufactured by Crouse-Hinds.
 - c. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting.
 - i) Material: Galvanized cast iron.
 - ii) Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
 - iii) Cover Legend: ELECTRIC.
 - iv) Model: WPD as manufactured by Crouse-Hinds.
- 4. Large Junction Boxes and Wiring Gutters
 - a. Indoor Locations:
 - i) Steel, NEMA 12.
 - b. Outdoors:
 - i) Stainless steel.
 - ii) Weather-tight NEMA 4.

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

- b) Insulation: 600V cross-linked polyethylene, UL Type XHHW/USE or THHN.
 - c) Suitability: Wet or dry locations at 75°C and 90° C copper temperature.
 - iii) Terminations
 - a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap standard cable around screw type terminals
 - b. Lighting Circuits
 - i) General Use:
 - a) Conductors: Single, copper, 12 AWG minimum.
 - b) Conductors may be solid or stranded.
 - c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
 - d) Suitability: Wet or dry locations at 75° C and 90° C copper temperature.
 - ii) Terminations:
 - a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap stranded cable around screw type terminals.
 - c. Control circuits
 - i) General Use:
 - a) Conductors: Single, tinned copper, 14 AWG
 - b) All conductors shall be stranded
 - c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
 - ii) Millivolt or Milliampere Instrumentation and Control.
 - a) Conductors: 18 AWG stranded copper, 2 or 3 as required.
 - b) Insulation: 15 mils, minimum, 90°C PVC.
 - c) Shield: Mylar aluminum tape with 20 AWG copper drain wire, fully covering conductors.
 - d) Jacket: 20 mils, minimum, 80°C PVC.
 - e) Suitability: Wet or dry steel conduit.
 - f) Manufacturers: Belden “UL Instrumentation Cable – 1032A”, Samuel Moore “Dekoron ICMX” No. 1852-686 and 1862-686, or equal.
11. Wiring Devices
- a. General:
 - i) Industrial Specification grade.
 - ii) White.
 - b. Receptacles:
 - i) 120 V duplex outlets: NEMA 5-20R, 3 wire, grounding, 20A, 125 V, Leviton 5362, or approved equal.
 - ii) 120 V duplex GFCI outlets: NEMA 5-20R, 3 wire, grounding, 20A, 125 V, Leviton 7899, or approved equal.
 - iii) 240 V duplex outlets: NEMA 6-20R, 3 wire, grounding, 20A, 250 V, Leviton 5462, or approved equal.
 - iv) Welding outlets: 50A, 125/250V, 3 pole, 4 wire, grounding, NEMA 14-50R, Leviton 55050, or approved equal.
 - c. Light Switches:
 - i) 277 V lighting circuits: 20 amp, 120/277 V, Leviton 1221-2W to 1224-2W, or approved equal.

12. Device Plates

- a. General:
 - i) Mounting hardware countersunk and finished to match plate.
 - ii) Provide over-sized plates where standard plates do not cover wall opening.
 - iii) Provide engraving as indicated on drawings.
- b. Indoors:
 - i) Surface mounted devices: Galvanized or cadmium-plated steel.
 - ii) Flush mounted devices in other finished areas: Phenolic plastic, white.
 - iii) All other flush mounted devices: Type 302 stainless steel.
- c. Outdoors and Indoors when identified on Drawings as Weatherproof:
 - i) Weatherproof with spring doors for receptacles and with provisions for padlocking switches on and off.
 - ii) Provide an adaptor plate for flush mounted device plates, Crouse-Hinds FS031, or equal.

13. Grounding and Bonding

- a. Provide rod electrodes, exothermic connections and mechanical connections.
- b. Building perimeter ground cable shall be minimum of 4/0 AWG bare copper.
- c. Duct bank ground cable shall be minimum of 4/0 AWG bare copper.
- d. Other ground cable shall be as noted on the drawings.

14. Power Panels

- a. General:
 - i) Circuit breaker panel board.
 - ii) With neutral.
 - iii) Dead front.
- b. Enclosure:
 - i) NEMA 12, surface in unfinished areas, NEMA 1 flush in finished areas or as indicated on the drawings.
 - ii) Door with latch and lock.
 - iii) Typewritten circuit directory.
 - iv) Ground stud bolt through cabinet with removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground conductor.
- c. Circuit Breakers:
 - i) Molded case thermal magnetic.
 - ii) Multiple pole breakers shall be common trip.
 - iii) Bolt-in.
 - iv) Individually front replaceable.
 - v) Indicating "On", "Off", and "Tripped".
 - vi) RMS symmetrical interrupting capacity shall be as indicated on the drawings.
 - vii) Breakers, trip ratings, and number of poles as indicated on the drawings.
- d. Buses:
 - i) Three phase and neutral bus insulated from cabinet.
 - ii) Ground bus.
 - a) Connected to cabinet.
 - b) Clamp type lug for supply circuit and each load circuit.
 - c) Removable bond to neutral bus.
 - iii) Copper bussing.
 - iv) Ampere and voltage ratings as indicated on the drawings.

- v) Bracing coordinated with circuit breakers interrupting capacity.
15. Lighting Panels
- a. General:
 - i) Circuit breaker panel board.
 - ii) With neutral.
 - iii) Dead front.
 - b. Enclosure:
 - i) NEMA 1 or as indicated on the drawings.
 - ii) Door with latch and lock.
 - iii) Typewritten circuit directory.
 - iv) Ground stud bolt through cabinet with removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground conductor.
 - c. Circuit Breakers:
 - i) Molded case thermal magnetic.
 - ii) Multiple pole breakers shall be common trip.
 - iii) Bolt-in or plug-in.
 - iv) Individually front replaceable.
 - v) Indicating "On", "Off", and "Tripped".
 - vi) 10,000 amp RMS symmetrical interrupting capacity at 240 V.
 - vii) Handle clips to prevent casual operation for circuit breakers indicated on drawings.
 - viii) Ground fault interrupting breakers with a sensitivity of 5mA for receptacle branch circuit and where indicated on drawings.
 - ix) Breakers, trip ratings, and number of poles as indicated on the drawings.
 - d. Buses:
 - i) Two phase and neutral bus insulated from cabinet.
 - ii) Ground bus.
 - a) Connected to cabinet.
 - b) Clamp type lug for supply circuit and each load circuit.
 - c) Removable bond to neutral bus.
 - iii) Copper.
 - iv) Ampere and voltage ratings as indicated on the drawings.
 - v) Bracing coordinated with circuit breakers interrupting capacity.
16. Equipment Disconnects
- a. General:
 - i) Heavy-duty safety switches.
 - ii) Square D or Cutler-Hammer.
 - b. Enclosure:
 - i) Indoor dry areas: NEMA 12.
 - ii) Outdoor: NEMA 4X.
 - iii) Use above guidelines unless otherwise noted on drawings.
 - iv) Padlocked external operating handle.
 - c. Switch:
 - i) 25,000 amp symmetrical withstand.
 - ii) Poles to match equipment served.
 - iii) 600 VAC.

- iv) Continuous current rating not less than the serving branch circuit over current protection.
- v) Non-fusible except where fusing is required by the served equipment or as noted on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General Requirements

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

B. Inspection

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

C. Equipment Installation

1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
 - a. Separate sheet metal junction boxes, equipment enclosures, sheet metal raceways, etc., mounted on water or earth-bearing walls or wall-mounted outdoors 1/4" from wall be corrosion resistant spacer.
 - b. Seal the base of all outdoor switchgear, motor control center, and similar equipment with grout.
 - c. Screen or seal with flexible sealing compound all openings into outdoor equipment to prevent the entrance of rodents, wasps, and mud-daubers.
 - d. Electrical work shall conform to the construction schedule and progress of other trades.
 - e. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
 - f. Perform all work in accordance with manufacturer's instructions.
 - i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
 - ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
 - g. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.

D. Identification:

1. Conduit. All conduits shall be provided with identification tags. Tags shall be brass nameplates with ½" high lettering and attached to the conduits by means of stainless steel wire. Conduits shall be identified at both ends with the same identification number.
2. Cable. Except for lighting and receptacle circuits, each individual wire in power, control, indication, and instrumentation circuits shall be provided with identification markers at the point of termination. Power wires without individualized identification numbers shall be color coded with electrical tape or colored wire jacket. The wire markers shall be of the heat-shrinkable tube type.
3. Control Stations. Control stations shall be provided with nameplates identifying the related equipment. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the drawings. Nameplates shall be laminated plastic, with 1/8 inch engraved letters, and shall be securely fastened to the control stations.
4. Circuit Breakers. Circuit breakers shall be provided with nameplates identifying related equipment. Nameplates shall be laminated plastic, with 1/8 inch engraved letters, and shall be securely fastened to the circuit breakers.

E. Raceways:

1. General:
 - a. Rigid steel conduit and aluminum conduit connections and terminations shall be reamed, de-burred, threaded and provided with bushings.
 - b. Securely fasten conduit connections to sheet metal enclosures with locknuts inside and out. Conduit hubs outdoors and in wet locations.
 - c. Provide deflection fittings across structural joints where structural movement is allowed.
 - d. Keep conduit clear of structural openings and indicated future openings.
 - e. Provide flashing and seal watertight conduits through roofs and metal walls.
 - f. Neatly grout conduit into any opening cut into structure.
 - g. Cap or plug conduits during construction to prevent the entrance of trash, dirt and water.
 - h. Minimum conduit size shall be ¾", except ½" for luminaries pendants or as noted on drawings.
 - i. Seal conduits with flexible sealing compound forced to a minimum depth equal to the conduit diameter after cable is installed.
 - j. Provide flexible conduit where flexible connections are necessary, including each motor without flexible cord.
 - i) Keep length to a minimum, not to exceed 6' maximum.
 - ii) No sharp bends.
 - k. Provide suitable pull string in each empty or spare conduit.
2. Conduit exposed in structures:
 - a. Install parallel to structural members and surface.
 - b. Install conduits of the same general routing parallel with symmetrical bends.
 - c. Arrange supports to prevent misalignment during wiring installation.
 - d. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

- e. Group related conduits; support using conduit rack. Construct rack using steel channel provide space on each for 25 percent additional conduits.
 - f. Install no more than equivalent of three 90° bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size.
 - g. Provide suitable pull string in each empty conduit except sleeves and nipples.
 - h. Maintain 6" clearance to ducts, piping and flues.
 - i. Support rigidly with galvanized or cadmium-plated hardware and framing materials, including nuts and bolts.
 - j. Allow 7' headroom for horizontal conduit runs, except along structures, piping equipment or where not possible.
3. Underground:
- a. One inch minimum.
 - b. Not encased in concrete.
 - c. Two foot minimum bend radius at vertical risers, Three foot elsewhere.
 - d. Provide 3 foot minimum earth cover.
 - e. Install underground conduits through buildings, manhole, handhole and vault walls in box outs as indicated on the drawings.
 - f. Isolate intercommunication and milliampere level instrumentation circuits from all power wiring raceways, conduits, boxes, vaults, manhole and handhole.
 - g. Provide a full-size extension for each underground conduit entering a building.
4. Junction boxes and wiring gutters:
- a. Install electrical boxes as shown on drawings and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
 - b. Install pull boxes and junction boxes to maintain headroom and to present neat mechanical appearance.
 - c. Install level and plumb.
 - d. Where indicated, provide a removable side opposite underground duct banks.
 - e. At least code size including space for full size continuation of any conduit not originally continued.
 - f. Arrange conduit for maximum space for future conduits.
 - g. Support boxes independently of conduit except cast box that is connected to rigid metal conduits both supported within 12 inches of box.

F. Wire and Cable

1. General:
- a. Protect the cable and avoid kinking conductors, cutting or puncturing jackets, contaminating by oil or grease or damaging in any manner.
 - b. Terminate stranded cable with lugs, cup washers, or pressure type connectors; do not wrap stranded cable around screw type terminals.
 - c. Splice stranded cable with pressure type connectors; do not use wire nut type connectors on stranded cable.
 - d. Splice cables only at readily accessible locations.
 - e. Do not pull cable tight against bushings or press heavily against enclosures.
 - f. Use cable pulling lubricants as recommended by the cable manufacturer.
 - g. Use swab to clean conduits and ducts before pulling cables.

- h. Install cable and accessories in accordance with manufacturer's instructions.
- i. Where necessary to prevent heavy loading of cable connectors due to cable weight, support cables in vertical risers with woven cable grips.
- j. Coil and tape spare cable ends.
- k. Support each 250 MCM or larger cable, and each conduit group of smaller cables from manholes, handholes or vault walls.
- l. Use Stranded conductor for feeders and branch circuits.
- m. Use stranded conductors for control circuits.
- n. Use conductor not smaller than 12 AWG for power and lighting circuits.
- o. Use conductor not smaller than 16 AWG for control circuits.
- p. Use 10 AWG conductors for 20 ampere, 120 Volt branch circuits longer than 100 feet.
- q. Pull all conductors into raceway at same time.
- r. Use suitable wire pulling lubricant for building wire 8 AWG and larger.
- s. Protect exposed cable from damage.
- t. Neatly train and lace wiring inside boxes, equipment, and panel boards.
- u. Clean conductor surfaces before installing lugs and connectors.
- v. Make splices, taps, and terminations to carry full ampacity of conductors.
- 2. Special cables:
 - a. Isolate networking and milliampere level instrumentation cables from all power circuits.
 - b. Isolate telephone cables from all other circuits.
- 3. Conductor identification:
 - a. Color code all service, feeder, and branch circuit conductors, 277/480 VAC and above as follow:
 - i) Phase A: Brown
 - ii) Phase B: Orange
 - iii) Phase C: Yellow
 - iv) Neutral: White
 - v) Ground: Bare or Green
 - b. Color code all feeder, and branch circuit conductors, 120/208 VAC as follows:
 - i) Phase A: Red.
 - ii) Phase B: Black.
 - iii) Phase C: Blue.
 - iv) Neutral: White.
 - v) Ground: Bare or Green.
 - c. Identify single control conductors by color coding orange and by labeling each end of conductors by color coding orange and by labeling each end of conductor with heat shrink-tube type wire markers.
 - d. Identify multi-conductor instrumentation and control cables with heat shrink-tube type wire markers.

G. Wiring Devices:

- 1. Flush mount wiring devices in concealed conduit system.
- 2. Surface mount wiring devices in exposed conduit systems.
- 3. Provide extension rings to bring outlet boxes flush with finished surface.
- 4. Clean debris from outlet boxes.

5. Install products in accordance with manufacturer's instructions.
6. Install devices plumb and level.
7. Install switches with OFF position down.
8. Install receptacles with grounding pole on bottom.
9. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
10. Connect wiring devices by wrapping conductor around screw terminal.
11. Use jumbo size plates for outlets installed in masonry walls.
12. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
13. Install wall switch 48 inches above finished floor.
14. Install convenience receptacle 24 inches above finished floor.
15. Inspect each wiring device for defects.
16. Operate each wall switch with circuit energized and verify proper operation.
17. Verify that each receptacle device is energized.
18. Test each receptacle device for proper polarity.
19. Test each GFCI receptacle device for proper operation.
20. Adjust devices and wall plates to be flush and level.

H. Grounding Materials:

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

- d. Form ground conductors on equipment to the contours of the equipment.
 - e. Install main ground cables with encased underground conduit banks in earth at least 3" below 1 corner of the duct bank.
 - f. Bond ground cables in underground circuits to main ground cables at each manhole, handhole, and vault.
- I. Lighting Panel
- 1. Wall mount in unfinished areas, flush mount in finished areas.
 - 2. Install lighting panel in accordance with NEMA PB 1.1.
 - 3. Install lighting panel plumb. Provide supports. Height: 6 ft. to top of lighting panel; install lighting panel taller than 6 ft. (2M) with bottom no more than 4 in. above floor.
 - 4. Provide filler plates for unused spaces in lighting panels.
 - 5. Provide typed circuit directory for each branch circuit in lighting panel. Revise directory to reflect circuiting changes required to balance phase loads.
 - 6. Measure steady state load currents at each lighting panel feeder; rearrange circuits in the lighting panel to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

3.2 FIELD QUALITY CONTROL

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

3.3 PROTECTION AND STORAGE

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

3.4 SYSTEM STARTUP

- A. The site is an existing lift station and shall be de-energized at any time without approval of the owner. The 240 volt single phase service shall remain online at all times. When the 480 volt 3 phase service is up and operational, then the station shall be de-energized while the existing 240 volt system is repowered from the new 240 volt single phase transformer. This shutdown shall be planned so it is a minimal amount of time.

END OF SECTION

SECTION 16250
ENGINE GENERATORS: DIESEL

PART 1 GENERAL

1.1 SUMMARY

- A. Engine-generator set
 - 1. River Glen Lift Station Standby Generator
- B. Provide engine generator set including but not necessarily limited to the following:
 - 1. Engine
 - 2. Cooling system
 - 3. Exhaust system
 - 4. Starting system
 - 5. Generator
 - 6. Fuel tank and associated fuel system
 - 7. Control equipment and accessories
 - 8. Housing
 - 9. Output circuit breaker

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. National Electrical Manufacturer's Association (NEMA)
 - 2. National Fire Protection Association (NFPA)
 - 3. Underwriter's Laboratories, Inc. (UL)
- B. Testing:
 - 1. Prototype Test: The manufacturer shall have successfully tested a prototype of each engine/generator set series offered. The tests performed shall include the following:
 - a. Maximum power test
 - b. Maximum motor starting kVA
 - c. Transient response, steady state governing, and voltage regulation
 - d. Single step load pick-up per NFPA 110
 - e. Three-phase short circuit test for mechanical and electrical strength
 - f. Fuel consumption
 - g. Cooling system test
 - h. Endurance run test
 - 2. Factory Tests: Prior to shipment, each unit shall be factory performance tested under load. Test results shall be certified and documented on a strip chart recorder. The tests shall be performed in accordance with the Manufacturer's standards and NFPA Standard 110. The following tests shall be performed:
 - a. Stepped load test at 1/2, 3/4, and full load for 5 minutes each step
 - b. Full single step block load

- c. Results documented shall include steady-state voltage and frequency analysis, transient response, maximum power analysis, and fuel consumption
- 3. Field Tests: Each complete installation shall be tested for compliance with the plans and specifications following completion of all site work. Testing shall be conducted by a representative of the supplier. The Contractor shall supply fuel, and other equipment required for the test. The Owner and Engineer shall be notified in advance and shall have the option to witness the tests. The tests shall be repeated until the equipment performs as specified. The tests to be conducted on site shall be as follows:
 - a. Cold Start Test: Perform a cold start test on the generator using the generator's actual load as a test load. A power failure shall be simulated by opening the normal power disconnect and the following information shall be recorded:
 - i) Cranking on time
 - ii) Time required to come up to speed
 - iii) Voltage and frequency overshoot
 - iv) Time to achieve steady state
 - v) Voltage, frequency, and amps at standby state
 - vi) Oil pressure, water temperature, and battery charge rate at 5 minute intervals for the first 15 minutes and at 15 minute intervals thereafter for 2 hours
 - b. Crank Cycle Test: Disable the generator from starting by a method approved by the Manufacturer and test the crank cycle by switching the generator to run
 - c. Safety Shutdowns: Test all the generator safety shutdowns

1.3 SUBMITTALS

- A. Verify dimensions, coordination and applicability of equipment furnished
- B. Full detail for performing of engine testing required. Upon completion of engine testing prepare and submit final results along with all new data
- C. Upon satisfactory completion of startup, secure a written statement from manufacturer that each engine generator is installed in accordance with manufacturer's recommendations, properly started up and is ready for operation by the Owner's personnel. Also certify that required operation and maintenance training has been fully satisfied.
- D. Wiring diagrams for each engine-generator set. Indicate clearly factory versus field wiring connections
- E. Generator fault current at full rpm and main circuit breaker trip curves and fault interrupting rating
- F. Operation and Maintenance Manuals

1.4 WARRANTY

- A. Minimum of one year warranty on all parts and labor

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Cummins/Onan
 - 2. Generac
- B. Assure engine, generator and accessories are provided by the engine manufacturer and its authorized dealer
- C. Assure local availability of service and replacement parts

2.2 PERFORMANCE AND OPERATING REQUIREMENTS

- A. Operating Conditions: Provide complete generator sets, controls and accessories rated for the following conditions:
 - 1. Location: Berthoud, CO
 - 2. Altitude: 5,000 FT AMSL
 - 3. Fuel: #2 diesel
 - 4. Enclosure rating: Outdoors
- B. Performance: Establish net rating of each generator set under operating conditions specified when equipped and fully loaded with all necessary operating accessories. Substantiate ratings with manufacturer's standard published curves and data.
 - 1. Minimum ratings:
 - a. Standby rating (at 0.8 PF): 40 kW
 - b. Frequency: 60 Hz
 - c. Voltage and phase: 480/3
 - d. Engine speed, max (rpm): 1800
 - e. Maximum voltage dip: 20%
 - 2. The unit shall be required to maintain the above noted parameters while starting and running the loads listed at the end of this section. The loads will not be started simultaneously.
- C. Fuel: Engines requiring special or premium fuel will not be acceptable

2.3 ENGINE

- A. Engine Construction: Provide diesel-type engine of heavy-duty construction, full compression ignition diesel, radiator and fan cooled
 - 1. Engines solid-state designed for cold quick start, capable of delivering full load output in 30 seconds
 - 2. Engine must meet scheduled performance without turbo-charging or after- cooling
 - 3. Provide exhaust manifolds

- B. Lubrication:
 - 1. Provide pressure-type lubrication system with gear-type oil pump and full flow filters fitted to engines. Provide level indicator or dipstick
 - 2. Locate filter for convenient servicing
 - 3. Oil drain piped to edge of skid with valve or cap
- C. Air Cleaner:
 - 1. Provide one or more dry-type replaceable element air cleaners suitable for high dust load operation
 - 2. Equip each air cleaner with service indicator
- D. Governor:
 - 1. Provide a fully enclosed electronic governor
 - 2. Frequency at any constant load shall not deviate more than plus or minus 0.5 percent of rated frequency
 - 3. The governor to provide adjustable frequency regulation from isochronous to 5 percent droop
- E. Fuel System: Dual replaceable element filter, engine supply and return line, solenoid, shut off valve, and engine driven fuel pump

2.4 GENERATOR

- A. Construction: Provide brushless, revolving field type, synchronous generator coupled directly to engine flywheel through a flexible driving disc for positive alignment
 - 1. Bolt generator housing directly to engine flywheel housing
 - 2. Provide volts-per type voltage regulator of solid state 3-phase sensing, construction matching characteristics of each unit. Provide no load to full load regulation within ± 0.5 percent at rated voltage during steady state conditions.
 - 3. Provide permanent magnet generator to provide excitation power to the automatic voltage regulator
 - 4. Provide shock-resistant mounting of regulators

2.5 COOLING SYSTEM

- A. Provide unit-mounted radiator cooling system with sufficient capacity for cooling generator set at full rated load and operating conditions specified
 - 1. Equip engine with engine-driven centrifugal-type water circulating pumps and thermostatic valve to maintain coolant temperature below 200 Deg F
- B. Coolant:
 - 1. Flush and drain cooling system
 - 2. Fill with minimum 50 percent ethylene glycol and water solution
 - 3. Assure radiator, engine block and related items protected to minus 50 Deg F
 - 4. Coolant drain piped to edge of skid with valve or cap

- C. Jacket Water Heaters: Furnish one or more engine mounted thermal circulation type water heaters to maintain engine jacket water at 70 Deg F at minimum ambient temperature specified
 - 1. Include integral thermostatic controls to maintain desired temperatures
 - 2. Rate heaters for 240 V, 1 PH, 60 HZ

2.6 EXHAUST SYSTEM

- A. Exhaust Silencer. Provide a Critical-grade silencer and related hardware to include side inlet, standard 125-150 LB flange connections, companion-flanges, cleanouts, Type E support arrangement, and stainless steel bellows type flexible exhaust connectors at least 24 IN long.
 - 1. Ensure silencers and related hardware are properly sized and installed according to the manufacturer's recommendation
 - 2. The silencer shall be mounted horizontally such that its weight is NOT supported by the engine
 - 3. Furnish and install exhaust pipe constructed of schedule 40 steel pipe with standard 125-150 LB flange connections as shown on the Drawings. Exhaust pipe size shall be sufficient to ensure that measured exhaust back pressure does not exceed 20 IN of water.
- B. Install insulation so that it does not interfere with the functioning of the flexible exhaust fitting
- C. Provide a 20 foot flexible connection hose for connecting the generator exhaust to on outside port when the generator is running in a building

2.7 STARTING SYSTEMS

- A. Starting Motors: Provide 24 V DC starting system with solenoid operated positive engagement drive
- B. Batteries: Furnish lead acid batteries with each engine generator with sufficient capacity to crank engines for three 20-second cranking periods with a 30-second rest period between cranks without recharging
 - 1. Provide battery rack appropriately sized for the batteries furnished, painted with alkaline-resistant paint
 - 2. Provide constant voltage, current limiting, full wave rectifier type battery chargers using silicon controlled rectifiers as the power controlling elements
 - 3. Provide float and equalize charge rates. Rate charger for 120 V, 1 PH, 60 HZ with output current rating to recharge the battery from a 70 percent discharged condition to 95 percent charged condition in 12 HRS
 - 4. Battery charger shall be 120V and shall be hardwired
 - 5. Provide malfunction alarm contacts for actuation of alarm in the event of malfunction in the battery charging system
 - 6. Provide DC voltmeter and ammeter, ac input and dc output circuit breakers
 - 7. Provide cables, clamps and all other necessary connections

8. Size main cables to exhibit total circuit resistant of 0.005 ohm or less
9. Batteries and charger located in generator enclosure
10. Starting shall be initiated by a normally open, dry contact closure

2.8 CONTROLS

A. Control Panel:

1. Provide NEMA 1 enclosed control panel mounted on each generator terminal box with vibration isolators.
2. Construct dead front panel with 14 GA steel
3. Include the following devices in panel:
 - a. Engine coolant temperature gage
 - b. Engine lube oil pressure gage
 - c. Engine lube oil temperature gage
 - d. Engine running hour meter
 - e. Battery charging indicators
 - f. Voltmeter
 - g. Ammeter with true RMS output, supplied by 3 CT's at generator output leads
 - h. Ammeter and voltmeter phase selector switch or switches
 - i. Frequency meter
 - j. Manual and automatic starting controls
 - k. Panel illumination lights and switch
 - l. Voltage level adjustment rheostat
 - m. Fault indicators including low oil pressure, high water temperature, overspeed and overcrank. Provide dry contacts for common annunciation of fault conditions.
4. Multifunction digital device incorporating all above functions will be acceptable

B. Main Line Circuit Breaker: Provide main circuit breaker for generator set, sized for appropriately to protect the generator

1. Breakers are to operate both manually for normal switching function and automatically during overload and short circuit conditions
2. The trip unit for each pole of each breaker is to have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection
3. Provide breakers to interrupt bolted 3 PH fault from generator at full rpm at load terminals
4. Provide a NEMA 1 enclosure for circuit breakers and mount on generator using suitable vibration isolators

2.9 SPARE PARTS

A. Furnish Owner the following extra parts and supplies for each generator set:

1. One set of filters, i.e., fuel, oil, and air for each unit
2. Oil for one complete oil change for each unit
3. Complete replacement set of all fuses

B. Spare parts shall be packaged with labels indicating contents of each package

PART 3 EXECUTION

3.1 MOUNTING, FUEL TANK AND ENCLOSURE

- A. Base: Mount engine, generator and cooling system on a common structural steel subbase capable of maintaining unit alignment suitable for mounting unit on a base fuel tank. Equip subbase with spring-type vibration isolators between subbase and fuel tank.
- B. Fuel Tank: Provide double-wall welded steel UL listed base tank assembly designed and supplied by the generator manufacturer.
 - 1. Size tank for minimum 24 HRS of continuous engine operation at 3/4 load
 - 2. Provide mounting and anchoring means suitable for installation on the trailer
 - 3. Provide double wall construction with leak detection and alarm contact
 - 4. Provide low fuel level alarm contact
 - 5. Provide fuel fill spill containment box
 - 6. Provide overfill prevention valve
 - 7. Provide liquid tight fill connection system
 - 8. Provide fuel fill drop tube
- C. Flexible Connections: Provide stainless steel flexible fittings on all engine piping and electrical conduits
 - 1. Engine control conduit
 - 2. Fuel connection: Braided metallic
 - 3. Exhaust connector bellows: Stainless steel
 - 4. Coolant water pipes: Braided metallic
- D. Enclosure:
 - 1. Equip engine generator set with a factory assembled ventilated sheet steel enclosure
 - 2. Provide weatherproof enclosure with an external critical grade silencer with rain cap
 - a. Provide housing with hinged side-access doors and a rear control door
 - b. All access doors to be lockable
 - c. Treat entire enclosure and skid tank assembly with an electro deposition primer process prior to finish painting for maximum durability
 - d. Equip the set with lifting eye
 - e. Enclosure shall be a sound attenuating enclosure and shall reduce the sound to a Level 1 sound attenuation. The level 1 sound attenuation shall reduce the sound to a maximum of 89dB at 7 meters distance with the generator fully loaded.

3.2 FIELD QUALITY CONTROL

- A. Employ and pay for services of equipment manufacturer's field service representative(s) to:
 - 1. Inspect equipment covered by these Specifications
 - 2. Supervise any adjustments and installation checks

3. Conduct initial start up of equipment and perform operational checks at jobsite.
Conduct field tests as specified
4. Provide instruction to Owner's personnel on training in operation and maintenance of equipment for a 4 hours period

Load List:

Description	HP/KW	Volts	Amperes	KVA
Pump #1	7.5	480	11	9.1
Pump #2	7.5	480	11	9.1
Controls		480	1	0.8
Lighting Panel, LP		480	8	6.7
ATS: 100A, 3 pole, 4 wire				
Totals			31.0	25.8

END OF SECTION

SECTION 16280

480 VOLT AUTOMATIC TRANSFER SWITCH

PART 1 GENERAL

1.1 SUMMARY

- A. This section covers the furnishing and installation of a 480 volt automatic transfer switch (ATS) for use with the generator. The ATS shall be provided by the generator supplier. The ATS shall be installed outdoors and therefore shall be enclosed in a NEMA 3R enclosure. The ATS current rating shall be as noted on the drawings.

1.2 SYSTEM DESCRIPTION

- A. This equipment will be connected to a 480 volt, 3 phase, 4 wire, solidly grounded system. A fully rated neutral lug shall be included in the ATS enclosure for connection of all the neutral conductors.

1.3 REFERENCES

- A. All equipment to be furnished under this section shall be designed, constructed, and tested in accordance with the latest applicable requirements of the standard specifications and codes of ANSI, NEMA, IEEE, and other such regularly published and accepted standards, as well as state and local codes and the USERC standards required by the local utility.

1.4 SUBMITTALS

- A. Submittals shall be required as noted in Sections 16050 and 16900

1.5 QUALITY ASSURANCE

- A. Supplier's qualifications
 - 1. The entire system shall be designed, coordinated, and supplied by a qualified Supplier who is regularly engaged in the business of ATS equipment. The Supplier shall meet the following qualifications.
 - a. The Supplier shall have and shall maintain a qualified technical staff and design office. The qualifications and experience of key project personnel shall be acceptable to the Engineer.
 - b. The Supplier shall have the physical plant and fabricating personnel to complete the work specified
 - c. The Supplier shall employ competent service personnel to service the equipment furnished. The geographic location of service personnel for this project shall be acceptable to the Engineer.
 - d. The Supplier shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years

1.6 WARRANTY

- A. The Supplier shall warrant the hardware for a period of one year from the date of system acceptance

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. All equipment furnished under this section shall be selected by the Supplier for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
 - 1. Acceptable Manufacturers. Subject to compliance with Contract Documents, the following manufacturers are acceptable:
 - a. Asco
 - b. GE Zenith
 - c. Cummins Power Generation
 - d. Or approved equal
 - 2. The ATS shall be supplied by the engine generator supplier who shall be responsible for the design, manufacture, coordination, and proper installation and operation of the automatic transfer switch.

2.2 MATERIALS AND EQUIPMENT

- A. Automatic Transfer Switch
 - 1. Each automatic transfer switch shall consist of a power transfer module and a control module, interconnected to provide complete automatic operation. The ATS shall be mechanically held and electrically operated by a single solenoid mechanism energized from the source to which the load is to be transferred. The switch shall be rated for continuous duty and be inherently double throw. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.
 - 2. The automatic transfer switch shall conform to the requirements of NEMA Standard ICS 2-447 and UL's UL 1008 and shall be UL listed for use in standby systems in accordance with Articles 517, 700, 701, and 702 of the NEC.
 - 3. The automatic transfer switch shall be rated as shown on the drawings.
 - 4. All main contacts shall be of silver composition. They shall be protected by arcing contacts. The operating transfer time in either direction shall not exceed 1/6 of a second.
- B. Control.
 - 1. The automatic transfer switch shall be controlled by a microprocessor-based programmable controller specifically designed for this function to provide rapid,

- reliable transfer of power between emergency and normal power conditions. The programmable controller shall be programmable from buttons on the front of the unit with an alphanumeric display for indication of entered values and any fault conditions.
2. Manual operation of the switch shall also be possible, as well as manual lockout.
 3. The following control shall be incorporated into the transfer switch:
 - a. Voltage sensing shall be provided on all phases. The pickup voltage shall be adjustable from 85% to 100% of nominal, and the dropout voltage shall be adjustable from 75% to 90% of the pickup value. The transfer to the emergency power supply will be initiated upon reduction of normal source to 85% of nominal voltage, and the retransfer to normal shall occur when normal source restores to 90% of nominal.
 - b. A time delay shall be provided to override momentary normal source outages to delay all transfer switch and engine starting signals. The time delay shall be field adjustable from 0.5 to 30 seconds and factory set at 10 seconds.
 - c. A time delay on retransfer to normal source shall be provided. The time delay shall be automatically bypassed if the emergency source fails and normal source is available. The time delay shall be field adjustable from 0 to 30 minutes and factory set at 10 minutes.
 - d. A timer shall be provided for the unloaded running time delay for emergency generator cool down. The time delay shall be field adjustable from 0 to 10 minutes and factory set a 5 minutes.
 - e. A contact shall be provided that closes when the normal source fails. This contact is for initiating the engine starting sequence. The contact shall be rated 10 amperes at 32 volts dc.
 - f. A white signal light shall be provided to indicate when the automatic transfer switch is connected to the normal source. A red signal light shall be provided to indicate when the automatic transfer switch is connected to the emergency source.
 - g. Two auxiliary contacts shall be provided that are closed when the automatic transfer switch is connected to normal and two auxiliary contacts shall be provided that are closed when the automatic transfer switch is connected to emergency. Contacts shall be rated 1 ampere, 240 volts, 60 Hz.
 - h. Programmed transition or in-phase monitor controls shall be provided to delay transfer from one active power source to another until the transfer can be done without causing nuisance tripping of circuit breakers and damage to the equipment.
 - i. A selector switch shall be provided for selecting manual or automatic retransfer to normal.
 - j. An engine generator automatic exercising timer shall be provided with the option of selecting to exercise under load or no-load conditions.
- C. Switching Components. The automatic transfer switch shall be rated to withstand 20,000 RMS symmetrical short circuit current at the automatic transfer switch terminals with the type of overcurrent protection and voltage as shown on the drawings.
1. Automatic transfer switches utilizing components of molded case circuit breakers, contactors, or parts thereof are not acceptable.

D. Enclosure

1. The ATS shall all be enclosed in a NEMA 3R enclosure

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General Requirements

1. It shall be the Contractor's responsibility to ensure that the entire electrical equipment is installed in a satisfactory condition per these specifications and the manufacturer's requirements.

B. Inspection.

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

C. Equipment Installation.

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

3.2 OPERATION AND TRAINING

- A. Step-by-step detailed instructions shall be furnished by the ATS supplier for the operation of the transfer switch. A minimum of 2 hours of training on the operation and

maintenance of the ATS shall be provided at the site at a time mutually agreeable to the owner's personnel and the manufacturer during normal business hours.

3.3 FIELD SUPERVISION AND TESTS

- A. The Contractor shall furnish the services of a competent manufacturer's technical representative to check the installation, make all necessary adjustments, and in the presence of the Owner's representative, test the transfer switch to determine whether the equipment conforms to specified requirements and properly controls the engine generator.

END OF SECTION

SECTION 16900

INSTRUMENTATION AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

- A. This section covers the furnishing and installation of metering and control equipment.
- B. Related Sections
 - 1. Materials and Equipment – Section 01600
 - 2. Electrical – Section 16050

1.2 REFERENCES

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

1.3 SUBMITTALS

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

- the related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections.
- e. If panel terminal designations, interdevice connections, device features and options, or other features are modified as a result of the fabrication process or factory testing, revised drawings shall be resubmitted.
 - f. A total of seven (7) copies for the submittal shall be provided.
2. Second-stage Submittal. Complete system documentation, in the form of operation and maintenance manuals, shall be provided. Manuals shall include complete product instruction books for each item of equipment furnished.
- a. Where instruction booklets cover more than one specific model or range of instrument, product data sheets shall be included which indicate the instrument model number, calibrated range, and all other special features. A complete set of “as-built” wiring, fabrication, and interconnection drawings, calibration and startup sheets shall be included with the manuals.
 - b. A copy of all final O&M manuals shall be provided in PDF format in a CD-ROM or DVD. All AutoCAD drawings shall be provided in PDF and DWG formats.
 - c. A total of five (5) printed copies, and ten (10) softcopies of final O&M manuals shall be provided.

1.4 QUALITY ASSURANCE

A. Supplier’s qualifications

1. The entire system shall be designed, coordinated, and supplied by a qualified system supplier (Supplier) who is regularly engaged in the business of designing and building instrument and control systems for water and wastewater projects. The Contractor’s intended instrumentation supplier shall meet the following qualifications.
 - a. The Supplier shall have and shall maintain a qualified technical staff and design office. The qualifications and experience of key project personnel shall be acceptable to the Engineer.
 - b. The Supplier shall have the physical plant and fabricating personnel to complete the work specified. The supplier’s fabrication capabilities and arrangements shall be acceptable to the Engineer.
 - c. The Supplier shall employ competent service personnel to service the equipment furnished. The geographic location of service personnel for this project shall be acceptable to the Engineer.
 - d. The Supplier shall provide a “Statement of Qualifications” indicating that they have successfully provided similar work for at least 5 years.

B. Coordination.

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

- interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.

1.5 WARRANTY

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

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

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

- devices shall have stamped stainless steel identification tags. Panel, subpanels, and rack-mounted devices shall have laminated plastic identification tags securely fastened to the device. Hand lettered labels or tape labels will not be acceptable.
6. Special Tools and Accessories. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

2.2 PANEL FABRICATION

- A. General Fabrication Requirements. All panels furnished hereunder shall conform to the requirements of NEMA ICS-6-1988. The following paragraphs describe general fabrication requirements for the instrument panels, consoles, enclosures, and subpanels:
 1. Wiring.
 - a. All internal instrument and component device wiring shall be as normally furnished by the manufacturer. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded tinned copper, insulated for not less than 600 volts, with a moisture-resistant and flame-retardant covering rated for not less than 90°C.
 - b. The power entrance to each panel shall be provided with a surge protection device. Surge protectors shall be nominal 120 VAC. Surge protectors shall be of a non-faulting and non-interrupting design, with a response time of not more than 5 nanoseconds. Surge protectors shall be Cutler Hammer AEGIS Powerline Filters, or equal.
 - c. Panels that are over 15 cubic feet in total volume shall have panel lighting above each door of the panel.
 - d. Power distribution wiring on the line side of the panel's protective devices shall be minimum 12 AWG. Secondary power distribution wiring shall be minimum 16 AWG. Wiring for control circuits shall be minimum 16 AWG. Electronic analog circuits shall be 18 AWG twisted and shielded pairs rated not less than 300 volts. Analog circuits shall be separated from ac power circuits. Wiring for ac power distribution, dc power distribution, and control circuits shall have different colors and shall agree with the color coding legend on the system supplier's panel wiring diagrams.
 - e. Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with a marking strip, covers, and pressure connectors. Terminals shall be labeled to agree with identification shown on the supplier's submittal circuits, plus one ground for each shielded cable. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 20% percent spare terminals shall be provided. Each control loop or system shall be individually fused, and all fused or circuit breakers shall be clearly labeled and located for easy maintenance. Terminal block shall be Phoenix Contact UT 4-MTD series.
 - f. All wiring shall be grouped or cables and firmly supported inside the panel. Wiring shall be bundled in groups and bound by nylon cable ties or shall be routed in nonmetallic slotted wire duct or similar. Ducts shall be readily accessible within the panel with removable covers and shall have a space of at

least 40 percent of the depth of the duct available for future use after installation is complete and all field wiring installed. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables. Wire duct shall be Thomas & Betts Ty Duct or approved equal.

- g. Where signal or loop wiring must be routed to more than one panel or device, the required circuit routing shall be as indicated on the one-line diagrams.
 - h. All analog input signals coming from external from the building shall have surge protection.
 - i. The panel fabricator shall provide such additional circuits as may be indicated on the electrical schematic drawings.
 - j. All wires in the panel shall be identified at both ends of the wire. These labels shall agree with the labels shown on the wiring diagrams. The wire labels shall be of the heat-shrink tube type of wire marker as manufactured by Brady thermal labels.
 - k. All instruments that require 120vac power that have the signal from the instrument going to a panel, shall be provided 120vac from that panel. The 120vac circuit to these instruments shall be individually fused.
- 2. Nameplates. Nameplates shall be provided on the face of the panel or on the individual device as required. Panel nameplates shall have approximate dimensions and legends, as indicated on the drawings, letters approximately 3/16 inch high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel. Panel face nameplates do not replace the requirement for device identification tags as specified herein under the Device Tag Numbering System paragraph.
 - 3. Painting. Interior and exterior surfaces of all panels shall be thoroughly cleaned and painted with rust-inhibitive primer. The panel interior shall be painted white with the manufacturer's standard coating. All pits and blemishes in the exterior surface shall be filled. Exterior surfaces shall be painted with one or more finish coats of the manufacturer's standard coating. Finish coats shall have a dry film thickness of at least 4 mils.
 - 4. Factory test. Panels shall be factory tested electrically by the panel fabricator before shipment.

2.3 METERING & CONTROL SYSTEMS

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

2.4 MATERIALS & EQUIPMENT

A. Panel Front-Mounted Devices

- 1. SELECTOR SWITCHES. Selector switches shall be a minimum 30 mm, heavy-duty, oil-tight type with gloved-hand or wing lever operators. Position legends shall be engraved on the switch faceplate. Switches for electric circuits shall have silver butting or sliding contacts, rated 10 amperes continuous at 120 volts ac. Contact configuration shall be as indicated on the drawings or as required for the application. Switches used in electronic signal circuits shall have contacts suitable for that duty.

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

B. Panel Interior-Mounted Devices

1. **POWER SUPPLIES.** Regulated DC power supplies for instrument loops shall be provided as needed. Power supplies shall be suitable for input voltage variation of plus or minus 10 percent. The DC power supplies shall be Idec "PS5R Slim line", or Phoenix Contact "Quint".
2. **RELAYS.** Relays indicated to be provided in panels, enclosures, or systems furnished under this section shall be of the plug-in socket base type with dustproof plastic enclosures unless noted otherwise. Relays shall be UL listed. Relays shall have a minimum rating of 10 amperes at 120 VAC. Time-delay relays shall have dials or switch settings engraved in seconds and shall have timing repeatability of +/- 2.0 percent of setting. Latching and special purpose relays shall be as required for the specific application. Relays shall have a light to indicate when coil is energized. Relays shall be Idec "RH or RTE Series" or approved equal.
3. **ELECTRONIC SIGNAL BOOSTERS AND ISOLATORS.** Electronic Signal Boosters and Isolators shall have all solid-state circuitry and complete electrical isolation between the power supply and the input and output signals. Accuracy shall be +/-0.15 percent of span. Isolators shall be manufactured by Acromag, Moore, or Phoenix Contact.
4. **CURRENT TO 4-20mA CONVERTER.** Current Transformer to 4-20mA Converter.
 - a. The converter shall measure the electrical ac current for a motor and convert the current to a linear 4-20mA signal

- b. Converter shall be loop-powered with a 24vdc powered loop
- c. Converter shall have an input range that is more than the full load amps (FLA) of the motor it is monitoring and less than 3 times this FLA
- d. The converter shall be a Cutler-Hammer EPRM series sensor or approved equal.

C. Flow Instrumentation

1. Magnetic Flow Meters

- a. The Magnetic Flow Meter shall be a completely obstructionless, in-line flow meter with no constrictions in the flow of fluid through the meter. The meter shall consist of a metallic tube with flanged ends and with grounding rings. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME B16.5, Class 150. Meters shall be suitable for the maximum range of working pressures of the adjacent piping. Electrode materials shall be fully compatible with the process fluid and shall comply with the requirements specified in the instrument device schedules. Each meter shall be factory calibrated, and a copy of the calibration report shall be submitted as part of the operation and maintenance manual submittal.
- b. The meter shall be capable of standing empty for extended periods of time without damage to any components. The meter housing shall be of a splash-proof and drip-proof design
- c. Power supply to the meter shall be 120 VAC, 60 Hz, single phase.
- d. Meters shall be Rosemount Type 1250 or approved equal.

2. Magnetic Flow Meter Signal Converters

- a. Magnetic Flow Meter Signal Converters shall be separately mounted, microprocessor-based signal converters. They shall be provided for the magnetic flow meters. The signal converters shall include output dampening, self-testing, integral digital indicator, built-in calibration capability, and an "empty pipe zero" contact input. The overall accuracy of the magnetic flow meter transmitter and signal converter shall be ± 1.0 percent of actual flow rate for full-scale settings of 0.3 to 30 fps. The signal cable between the converter and the magnetic flow meter shall be furnished by the meter manufacturer. The signal converter shall be housed in NEMA Type 12 housing and shall be suitable for operation over an ambient temperature range of -30° to $+140^{\circ}$ F, and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA DC.
- b. The signal converter shall have a seven-digit, non-reset totalizer on the face of the enclosure. Local electronic indicators shall be provided. Indicators shall be mounted on or near the flow meter signal converters in weatherproof NEMA Type 4 housings. Indicators shall be four-digit LCD type and shall read in engineering units.

3. Pressure and Level Instrumentation

- a. Pressure and Pressure Sensing Level Transmitters.
 - i) Transmitters used to measure process pressure, or inferred level from process pressure such as a bubbler system or other source, shall have all solid-state electronic circuitry and shall be of the two-wire type which requires no direct power connection to the transmitter. Transmitters shall have self-diagnostics and electronically adjustable span, zero, and damping. Transmitters shall be enclosed in a NEMA Type 4X housing and shall be suitable for operation at temperatures from 0 to 180 F. All transmitter parts shall be of a corrosion-

resistant material. Vents shall be provided on the sides of the diaphragm housing body. Transmitter shall have over-range protection to maximum process line pressure. Accuracy shall be plus or minus 0.5 percent of calibrated span, with repeatability of 0.1 percent. Transmitter output shall be 4-20mA dc without the need for external load adjustments and shall have an elevated or suppressed zero as required by the application. Transmitters shall be furnished with integral indicators with 0-100 percent linear scales.

- ii) Differential type transmitters shall be used if required to meet the input range, elevation, or suppression requirements.
- iii) Each transmitter shall be provided with a process shutoff valve and a bracket for mounting as required. Transmitters shall be factory calibrated to the required range. Transmitters shall be Rosemount "Model 2088" or approved equal.

b. Hydrostatic Level Transducers

- i) Each transducer shall be a hydrostatic pressure sensor for level measurement of fresh water and wastewater applications. The sensor shall be a permanently sealed submersible probe and cable combination. The transducer shall be a of the two-wire type which requires no direct power connection to the transducer. Transducer output shall be 4-20mA DC. The transducer shall be capable of the ranges and pressures for which the application will require. The sensor shall be mounted as shown on drawings or as required for application. The transducer shall be an Endress-Hauser "WaterpilotFMX167", GE Sensing (Druck) "PDCR/PTX- 1730", or approved equal.

c. Ultrasonic Level Transmitters

- i) Each ultrasonic level transmitter shall be a microprocessor-based electronic unit consisting of a sensor assembly, a signal converter/transmitter, and an interconnecting cable. The sensor shall be encapsulated in a chemical- and corrosion-resistant material such as keener or CPVC, and shall be suitable for operation over a temperature range of -20 to +150°F and a relative humidity of 10 to 100 percent. The sensor shall be compatible with the process media being measured. The sensor shall be an explosion-proof design suitable for use in all hazardous areas. Sensors mounted in areas subject to freezing shall be provide with special transducers or protected against icing by heaters. Sensors mounted in direct sunlight shall be provided with sunshades.
- ii) The supplier shall furnish drawings complete with dimensions and elevations for the sensor mounting.
- iii) The ultrasonic level transmitter shall have automatic compensation for changes in air temperature at the sensor location. If separate temperature sensing probes are provided, they shall be mounted with or adjacent to the ultrasonic sensor, as recommended by the manufacturer. The transmitter shall have a four-digit LCD display scaled to read in engineering units. Digit height shall be approximately 0.5 inch. The transmitter shall be designed to ignore momentary level spikes or momentary loss-of-echo. A loss-of-echo condition shall be indicated on the transmitter unit and shall be available as an alarm contact output. The transmitter output shall be an isolated 4-20 mA dc signal linearly proportional to the measured level range. Where specified, the output shall be characterized to be proportional to the tank volume instead of

to the tank level. Calibration parameters shall be entered through a keypad on the unit and shall be stored in nonvolatile EEPROM memory. Accuracy of the transmitted signal shall be +/-0.5 percent of the level range.

- iv) The transmitter shall contain four independently adjustable level alarm contact outputs. Contacts shall be single-pole, double-throw, rated not less than 5 amperes at 120 volts ac.
- v) A sufficient length of sensor-to-transmitter signal cable shall be furnished with the instrument to locate the sensor 25 to 200 feet from the signal converter. The signal converter electronics shall be housed in a NEMA Type 12 enclosure suitable for wall mounting and for operating temperatures of -15 to +125° F and a relative humidity of 10 to 100 percent. The signal converter shall be powered from 120 volts ac, 60 Hz. The ultrasonic level transmitter shall be Siemens "Multiranger", Endress Hauser, or approved equal.
- d. Weighted Float Level Switches
 - i) Each level switch shall consist of a single-pole, double-throw switch, rated not less than 3 amperes AC, sealed and housed in a chemical-resistant polypropylene casing. The switch assembly shall be weighted and suspended on its own cable. The flexible support cable shall be waterproof, three-conductor, synthetic covered cable with 18AWG conductors, and shall be of sufficient length so that no splice or junction box is required in the wetwell. Switches shall be suitable for operation up to 150 volts within an ambient temperature range of 0° to 60° C. Switches shall be suitable for use in a sanitary or wastewater wetwell environment. Installation hardware shall be provided as shown on the drawings or as necessary for application. Switches shall be Flygt "Type EMN-10", Siemens Water Technologies "Model 9G-EF", or approved equal.
- e. Combination Pressure Gauges
 - i) Combination pressure gauges shall have a built-in pressure snubber and 4-1/2 inch minimum diameter faces and be turret style, black phenolic case with clear glass face. The movement shall be rotary, of 400 Series stainless steel with teflon coated pinion gear and segment. The gauge shall be bottom connected and accept a 1/4" NPT female thread. Combination pressure gauge range and scale graduations shall be in psi and feet of water as follows:
 - ii) Pressure - 0 to 50 psi, 5 psi figure intervals, with graduating marks every 1/2 psi (0-115 feet).
 - iii) Gauges will be direct mounted or panel mounted as required. Panel mounted gauges shall be off the piping and be flexible connected to their respective sensing point. The gauge trim tubing shall be complete with both isolating and vent valves and the tubing shall be so arranged as to easily vent air and facilitate gauge removal. Gauges mounted directly to the pipeline or at the sensing point will not be accepted. Gauges shall be Ashcroft "Duragauge Plus model 1279XLL" or approved equal.

D. Miscellaneous Equipment

1. Cellular Autodialer

- a. The automatic dialer shall be a cellular based phone dialer

- b. The automatic dialer system shall be capable of dialing up to 48 telephone numbers, each up to 60 digits in length. Work scheduling systems shall be available on the system for the dialing options.
- c. The basic unit shall continuously monitor the presence of AC power and the unit's environmental temperature.
- d. Each input channel shall be independently programmable, without the need to manipulate circuit board switches or jumpers. The standard unit shall be modular in design, permitting it, therefore, to accept "plug-in" expansion circuit boards.
- e. Alarms are acknowledged either by pressing the appropriate acknowledge code when called or by acknowledgement over the internet.
- f. Normal power shall be 105-135 VAC, 15 watts nominal. The product is to contain its own gel cell rechargeable battery which is automatically kept charged when AC power is present. The system shall operate on battery power for a minimum of 20 continuous hours in the event of AC power failure.
- g. The dialer shall be a Mission Unit Model 800 w/ a minimum of 8 dry contact inputs and 2 analog inputs or as needed based on the autodialer signal list at the end of this section
- h. The dialer shall be provided with a 3 year service plan included.
- i. Inputs and outputs from the autodialer shall be according to the I/O list at the end of this specification.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General Requirements

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

B. Inspection.

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

C. Equipment Installation.

- 1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.
 - a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
 - b. Perform all work in accordance with manufacturer's instructions.

- i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
 - ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
 - c. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.
 - d. Field Piping. Field piping materials and installation shall conform to the requirements of the miscellaneous piping section.
 - e. Field-Mounted Instruments. Instruments shall be mounted so they may be easily read and serviced and all appurtenant devices are easily operated. Installation details for some instruments are indicated on the drawings. Unless otherwise indicated on the drawings, instruments which include local indicators shall be mounted approximately 5 feet above the floor and shall be oriented for ease of viewing. Transmitters shall be mounted on corrosion-resistant pipe supports suitable for floor, wall, or bracket mounting.
- D. Field Calibration. A technical representative of the system supplier shall calibrate each instrument and shall provide a written calibration report for each instrument, indicating the results and final tuning adjustment settings. The adjustment of each calibrated instrument shall be sealed or marked, insofar as possible, to discourage tampering. Instruments shall be calibrated before checkout of the operation of the system.
- E. Systems Check. A technical representative of the system supplier shall participate in the checkout of metering and control systems. If interrelated devices furnished by other suppliers, such as valve actuators, motor controls, chemical feeders, or primary measuring devices, do not perform properly when placed in service, the technical representative shall use suitable test equipment to introduce simulated signals to verify or measure signals from such devices as required to locate the source of trouble or malfunction. A written report stating the results of such tests shall be furnished, if requested by the Engineer, to assign responsibility for corrective measures.
- 1. Installation Test Equipment. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by the Contractor for the duration of the testing work. Unless specified otherwise, test equipment will remain the property of the Contractor or the system Supplier.
- F. Adjustment and Cleaning
- 1. Perform all required adjustments, tests, operational checks, cleaning and other start-up activities required.
 - 2. Take precautions, as necessary, to properly protect all equipment from damage. Installed equipment to be protected from further construction operations.

3.2 CUSTOMER TRAINING

- A. The coordinating supplier shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of the equipment. The training session shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of one 4-hour session, and the schedule shall be arranged and coordinated with the Engineer.

3.3 INSTRUMENT LIST

Tag #	Description	Service	Scale	Provided Under Specification
FE/FIT-10	Station Discharge Flow Meter	Magnetic Flow Meter	0-100 SCFM	16900
FIR-10	Flow Recorder	Circular Chart		Existing
LT	Wetwell Level Transmitter	Hydrostatic Level Transmitter	0-15 FT	Lift Pump Provider
LSH	Wetwell High Level Float	Float Switch		Lift Pump Provider
LSL	Wetwell Low Level Float	Float Switch		Lift Pump Provider

3.4 AUTODIALER LIST

Channel	Description	Signal Type	Notes
1	Wetwell Level	AI	From Lift Station Control Panel
2	Station Flow	AI	
3	Wetwell High Level Alarm	DI	From Lift Station Control Panel
4	Wetwell Low Level Alarm	DI	From Lift Station Control Panel
5	Pump #1 – Run Status	DI	From Lift Station Control Panel
6	Pump #2 – Run Status	DI	From Lift Station Control Panel
7	Pump #1 – Fault Status	DI	From Lift Station Control Panel
8	Pump #2 – Fault Status	DI	From Lift Station Control Panel

END OF SECTION