Project Manual
Including Specifications for
The Construction of

SANTA FE COUNTY
CAÑONCITO REGIONAL WATER SYSTEM IMPROVEMENTS PHASE II
Canoñcito, New Mexico 87505
December 2019

OWNER:

Santa Fe County
P.O. Box 276
Santa Fe, New Mexico 87507

ENGINEER:

MOLZEN CORBIN
2701 Miles Road, SE
Albuquerque, New Mexico 87106

MOLZENCORBIN
ENGINEERS | ARCHITECTS | PLANNERS

SFC184-12

ENGINEER OF RECORD

Molzen Corbin
2701 Miles Road, S.E.
Albuquerque, New Mexico 87106
(505) 242-5700

The technical material and data contained in the specifications were prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

(SEAL)

JONAH S. RUYBALID
NEW MEXICO
23909
PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION

12-6-19

Jonah S. Ruybalid, P.E.

N.M.P.E. No. 23909

All questions about the meaning or intent of these documents shall be submitted only to the Engineer of Record, stated above, in writing.

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BID

BID FORM

PROJECT IDENTIFICATION:

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to: Santa Fe County
P.O. Box 276
Santa Fe, New Mexico 87507

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner. Bidder will sign and submit the Agreement and the Bonds and other documents required by the Bidding Requirements within ten days after the date of Owner's Notice of Award.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.	Addendum Date

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

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D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in SC-4.02, and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06.

E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

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D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder shall complete the Work in accordance with the Contract Documents for the following price(s):

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
1	6" PVC waterline pipe.	LF	12,740	$	$
2	6" waterline installation including trenching and backfilling, identification tape, tracer wire, restraints, fittings, bedding materials, and all associated work, 4′ minimum bury.	LF	1,274	$	$
3	6" waterline installation including rock excavation, trenching and backfilling, identification tape, tracer wire, restraints, fittings, bedding materials, and all associated work, 4' minimum bury.	LF	11,466	$	$
4	2" HDPE DR-9 pipe.	LF	4,480	$	$
5	2" waterline installation including trenching and backfilling, identification tape, tracer wire, restraints, fittings, bedding materials, and all associated work, 3' minimum bury.	LF	2,240	$	$
6	2″ waterline installation including rock excavation, trenching and backfilling, identification tape, tracer wire, restraints, fittings, bedding materials, and all associated work, 3′ minimum bury.	LF	2,240	$	$
7	Horizontal Directional Drilling including 6" HDPE pipe.	LF	165	$	$
8	Residential water service connection and meter box, including saddle tap, corporation stop, service line, meter yoke and tubing all associated appurtenances, and all incidental work, complete in place for properties adjacent to the waterline installation.	EA	90	$	$

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Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
9	Flush Port Assembly including installation.	EA	10	$	$
10	Fire hydrant Assembly including installation, gate valve, and two bollards per hydrant.	EA	21	$	$
11	Remove and Replace Asphalt Pavement	SY	10	$	$
12	Culvert crossing incl. hand work and pea gravel backfill.	EA	31	$	$
13	6″ Gate Valves including installation.	EA	19	$	$
14	1″ Air/Vacuum Valve Station including installation, CIP.	EA	15	$	$
15	Remove and Dispose of Existing Water Meter, cut, and cap existing service connections.	EA	80	$	$
16	Remove Existing Fire Hydrant for pickup by County, cut and cap existing waterline.	EA	6	$	$
17	Connect 6″ PVC Waterline to new 8″ PVC waterline stub outs on Old Las Vegas Highway including solid sleeve coupling, and all associated work.	EA	4	$	$
18	Construction Staking by New Mexico Registered Professional Surveyor.	LS	1	$	$
19	Traffic Control.	LS	1	$	$
20	SWPPP.	LS	1	$	$
21	Mobilization, Insurance, and Bonds.	LS	1	$ 95,000.00	$ 95,000.00
22	Demobilization and Closeout.	LS	1	$ 30,000.00	$ 30,000.00
23	Laboratory Testing Allowance.	ALLOW	1	$ 15,000.00	$ 15,000.00
24	Utility Relocation Allowance.	ALLOW	1	$ 10,000.00	$ 10,000.00
25	Pre-Authorized Construction Changes.	ALLOW	1	$ 20,000.00	$ 20,000.00
26	Environmental Monitoring.	ALLOW	1	$ 85,000.00	$ 85,000.00
				Base Bid Subtotal	$
				NM Gross Receipts Tax @ 7.125%	$

TOTAL BID AMOUNT $ _____

Unit Prices have been computed in accordance with Paragraph 11.03 of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

5.02 This Contract will be awarded on the basis of the lowest responsive total Bid received from a responsible Bidder. If the lowest acceptable Bid exceeds available funds, the Owner retains the right to reject all Bids or negotiate a change of scope with the lowest responsive Bidder. Owner may only negotiate up to 10% higher than the budgeted project funds. Such negotiation shall not be allowed if the lowest Bid is more than 10% over the budgeted project funds. If a change of scope is negotiated and effected, it will be in the form of a formal

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Change Order to the Contract. If these conditions are not satisfied, the Owner is required to reject all Bids and re-bid the project to comply with State procurement requirements.

5.03 Gross receipts tax rates will be adjusted by the Contractor during the construction period to reflect the actual applicable rates issued by the New Mexico Taxation and Revenue Department.

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid Security

B. List of Proposed Subcontractors for compliance with New Mexico Subcontractor's Fair Practices Act

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

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ARTICLE 9 – BID SUBMITTAL

9.01 This Bid is submitted by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____

A Partnership

Partnership Name: _____

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____
Type (General Business, Professional, Service, Limited Liability):_____

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest _____

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A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____(SEAL)

By: _____
(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

Bidder's Business Address _____

_____

Phone No. _____ Fax No. _____

E-mail _____ _____

SUBMITTED on _____, 20____.

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New Mexico Contractor's License Number _____

License Classifications _____

New Mexico Department of Workforce Solutions Registration Number _____

Federal Identification Number (FEIN #) _____

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TECHNICAL SECTIONS

SECTION 01 00 01

SPECIFICATION FORMAT

PART 1 GENERAL

1.01 FORMAT

A. The Division 1 through 48 Specifications are written in imperative and abbreviated form. This imperative language is directed at the Contractor, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting “shall”, “the Contractor shall”, and “shall be” or similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words “shall be” are to be placed by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, the Contractor shall fulfill (perform) all indicated requirements whether stated imperatively or otherwise.

B. All equipment and facilities shall be furnished, installed, and constructed by the Contractor to provide the Owner with complete, ready to use components, systems, and facilities. All necessary materials and Work required to accomplish this are the responsibility of the Contractor alone, whether or not specifically indicated on the Drawings or stated in the Specifications.

C. The various Sections of the Division 1 through 48 Specifications may contain references to standards, other specification sections, or items that do not apply to the Work covered in this project. These inappropriate references are to be considered irrelevant and ignored by the Contractor. If conflicts arise from erroneous references or lack of references to standards or other specification sections, Engineer will determine the relevancy of the apparent conflicts.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work under this contract includes the construction of 6-inch PVC waterline, water service lines, water meters, valves, fire hydrants, air valves, and all associated work. Refer to the Bid Form for project quantities, additive alternates, and additional items.

1.02 DESCRIPTION

A. Base Bid: Includes all elements of construction for the complete and operational construction of this project, except for those items indicated as Additive Alternates.

B. Additive Alternates: Includes all elements of construction for items listed as additive alternates on the bid form. This work may be awarded to the contractor upon County discretion.

1.03 ALLOWABLE PIPE MATERIALS FOR NEW WATERLINE

A. The Cañoncito Waterline shall be constructed using the following pipe materials, unless noted otherwise in the Contract Documents for specific areas:
   1. PVC Pipe, C900.
   2. High Density Polyethylene (HDPE) (2-inch and smaller).
   3. High Density Polyethylene (HDPE) (6-inch horizontal directional drill).

B. PVC Pipe, C900:
   1. Where buried pipe restraint is required by these Contract Documents, use external pipe restraint devices for PVC C900 pipe as specified in Section 33 12 01 – Water Systems, subsection 2.01 C. – External Mechanical Restraint Devices.

C. Pipe Fittings:
   1. All buried pipe fittings shall be ductile iron as specified in Section 33 12 01 – Water Systems, subsection 2.01 – Materials and Fabrication, and restrained with external mechanical restraint devices.

1.04 CONTRACT

A. The Work shall be performed under unit prices/lump sum bid items and reimbursable allowances.

1.05 SUMMARY BY REFERENCES

A. Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions, Specification Sections, Drawings, Addenda and Modifications to the Contract Documents issued subsequent to the initial printing of this Project Manual and including, but not necessarily limited to, printed material referenced by any of these. It is recognized that work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon, including weather conditions and other forces outside the Contract Documents.

1.06 CONTRACTOR USE OF THE PREMISES

A. The immediate premises of work will be at the disposal of the Contractor during the construction period.

1.07 SPECIAL CONDITIONS

A. Borrow Sites for Fill Material:
   1. Designated borrow sites for fill material are not available along the project limits.

1.08 FILL MATERIAL

A. All fill material provided by Contractor shall be in full compliance with requirements stipulated in Section 31 23 00 – Excavation and Fill, Section 31 23 33 – Trenching and Backfilling, and where specified elsewhere in the Contract Documents.

B. Contractor is solely responsible for providing suitable backfill material where needed at no additional cost to Owner unless specifically identified in the bid form.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXECUTION

A. General: Immediately after award of the Contract, thoroughly and clearly advise all necessary personnel as to the nature and extent of the project.

END OF SECTION

SECTION 01 12 16

WORK SEQUENCE

PART 1 GENERAL

1.01 GENERAL DESCRIPTION OF WORK SEQUENCE

A. Part 1 - Storm Drainage Discharge Compliance:
   1. Prepare a Storm Water Pollution Prevention Plan and file all required USEPA-NPDES Program documents prior to commencement of construction; see Section 01 74 17 – Storm Drainage Discharge Compliance for requirements.
   2. Contractor shall implement and maintain full compliance of USEPA-NPDES Program requirements during construction.

B. Part 2 - Construct 6-inch water line, and appurtenances as shown on Drawings. Complete roadway subgrade preparation and base course work if subgrade preparation and base course is included in the contract.
   1. The existing water system is to be remain in service for the duration of the project until a complete switchover can be made from the existing waterlines to the new waterlines. The contractor shall pothole for all existing utilities to determine the location of those utilities. Contractor shall identify any conflicts and discuss those conflicts with the Engineer. This may require minor horizontal and/or vertical waterline alignment changes to avoid conflict with the existing waterlines.
   2. Complete all trenching, waterline installation, gate valve installation, fire hydrant installation, air valve installation, backfilling, and compaction. Bag new fire hydrants to designate the hydrant is not in service.
   3. If the additive alternates including subgrade preparation and base course installation; complete subgrade preparation, installation of base course, and compaction. Contractor may complete subgrade preparation and base course installation at the completion of all the waterline work if it is determined that it would be advantageous from a traffic control/scheduling standpoint.
   4. Submit all compaction test results to Engineer. Submit test results as tests are completed.
   5. Construct water meters and service connections to new 6-inch waterline. Existing water service connections to remain active until directed to be taken out of service by County and Engineer. New water meters and service connections may be constructed concurrently with steps 2 and 3 of Part B if advantageous from a scheduling standpoint.
   6. Notify in writing to Engineer that the water line and appurtenances are ready to be inspected for a Suspension of Work completion punch list. Upon completion of Suspension of Work completion punch list, Contractor will complete work prior to work suspension.
   7. A suspension of work will take place after all waterline, service lines, water meters, valves, hydrants are installed and the pre-substantial completion punch

list work is completed. The suspension of work will end when a separate project is constructed to bring Santa Fe County water along the Old Las Vegas Highway to Cañoncito. At that time, Santa Fe County and the Engineer will notify the Contractor that County water is available in the area and that the project can be completed. The Contractor will be required to begin work within 1 month and must have the project completed including all punch list items as a result of the substantial completion inspection within 3 months of being notified that water is available.

8. Contractor to submit plan for flushing, pressure testing, and disinfection to the Engineer for review. Upon review of the Contractor prepared plan by the Engineer, Contractor to complete flushing, cleaning, pressure testing, and disinfection of water line and appurtenances. Submit all, pressure tests and disinfection tests results to Engineer. Submit test results as tests are completed.
9. Notify in writing to Engineer that the water line and appurtenances are ready to be placed in service, and that the connections to the waterline on Old Las Vegas Highway are ready to be completed.
10. With written approval from Engineer, complete connections to the existing system. Complete waterline connections to the 6-inch stub outs at the Calle Gurule/Old Las Vegas Highway intersection and the Red Hills Lane/Old Las Vegas Highway intersection. If the additive alternates are included in the work for work on Fournier Court, Calle Cañoncito, and Browne Lane, than complete waterline connections to the 6-inch stub outs at, the Fournier Court/ Old Las Vegas Highway intersection, and the Calle Cañoncito/ Old Las Vegas Highway intersection. Place new waterline in service. Service connections will not be switched on the property owner's side of the meter from the old meter to the new meter at this time, as that will be the responsibility of the property owner as they see fit.
11. Notify in writing to Engineer that the work is substantially complete and ready for the substantial completion inspection and identify any work remaining prior to demobilization. Follow contract closeout processes identified in Section 01 77 00 – Contract Closeout of the Technical Specifications.

1.02 COORDINATION AND GENERAL REQUIREMENTS

A. Comply with all conditions of the Owner-Provided NMDOT permits as specified under Paragraph 1.06 of this Section.

B. Contractor shall coordinate, schedule, and execute work so the Owner's ability to continuously convey and transfer water with its existing facilities and/or new facilities is never hindered.

C. Do not operate or adjust existing valves without specific case-by-case approval of Owner's water department manager. After shakedown, do not operate or adjust new valves unless Owner's water department manager is notified and such action is needed for training, warranty work or emergencies.

D. Emergency Response:
1. Contractor's representative available at all times to respond to emergencies related to Work.
2. Provide response within 60-minutes of notice.
3. Provide positive method of contacting Contractor's representatives by Engineer and by Owner's representative at any time.

E. Contractor is responsible for all damages during the course of construction resulting from breaking existing pipes, spills and any other discharge violations during construction.

1.03 RELATED SECTIONS

A. Section 01 74 17 – Storm Drainage Discharge Compliance.

1.04 FACILITIES REQUIREMENTS

A. General: Applies to work noted in Paragraph 1.01.
1. Pressure Testing, Flushing and Disinfection of Waterlines:
a. Contractor to prepare and submit plan for pressure testing, flushing and disinfection of waterlines to Engineer, as specified in Section 33 13 13 – Disinfection of Domestic Water Systems.

B. Implementation Plan:
1. Contractor is required to prepare and submit to the Engineer an implementation plan and detailed schedule showing the Contractor's tasks and sequence of tasks for completing all the work.
2. Contractor to identify any conflicts between construction tasks which may cause an interruption of the Owner's ability to convey and transfer water in its piping network.
3. Submit to Engineer 3 weeks after Notice to Proceed.

C. Hazardous Environmental Conditions at Site:
1. Although not anticipated, if hazardous materials or hazardous conditions are encountered during construction, notify the Engineer and Santa Fe County immediately.

D. Archaeological Sites:
1. Environmental monitoring has been included in the contract for the eastern half of the project. Although no other sites are anticipated, if the Contractor encounters an archaeological site during construction or has any reason to believe it may be an archaeological site, report immediately to the Engineer and the Owner.
2. If such a site is discovered, applicable State and/or Federal guidelines and procedures will be implemented.

1.05 COORDINATION WITH OIL, GAS, AND COMMUNICATIONS UTILITY OWNERS

A. Contractor is responsible for complying with New Mexico State Excavation Law prior to performing any excavations (NM ONE CALL 811).

B. Before crossing an existing utility with new construction, the Contractor is required to notify that specific utility owner, not less than a 10 working-day notice.

C. Existing utility owners require their field representatives to be on site during crossing of buried utility with new waterline. Contractor is responsible for all coordination with existing utility owner.

D. List of Utility Owners and Contact Information: See sheet G-003 of the plan set.

1.06 SPECIAL REQUIREMENTS FROM OWNER-PROVIDED PERMITS

A. The Owner has acquired permits from New Mexico Department of Transportation to construct the new waterline for this project. Contractor must comply with **ALL** requirements noted in the respective Permit.
   1. The Owner delegates compliance of all applicable items in the respective Permit to the Contractor.
   2. Contractor is instructed to comply with **ALL** Permit requirements.

B. New Mexico Department of Transportation Permit:
   1. Contractor shall comply with permit requirements (at no additional cost to Owner) identified in the Permit. Permit is included in Appendices of the Contract Documents.
   2. The Owner delegates compliance of all applicable items in the Permit to the Contractor.
   3. Refer to Section 01 71 23.17 – New Mexico Department of Transportation Utility Permit Survey Requirements for additional information.

1.07 ADJUSTMENTS TO SEQUENCING REQUIREMENTS

A. The Owner may require the Contractor to make adjustments to the requirements of the Section to accommodate unforeseen conditions and situations. Reasonable adjustments shall be made by the Contractor at no additional cost to the Owner or additional Contract time.

1.08 SUBSTANTIAL COMPLETION

A. Refer to Section 01 77 00 – Contract Closeout, for description of Substantial Completion.

1.09 SPECIAL CONSIDERATIONS

A. No electrical power exists along the majority of the construction areas. Provide all necessary power generation equipment or temporary electrical power supply for construction.

B. Provide temporary pumps, power generator, piping, fittings, labor, and equipment to produce water for construction, testing, flushing, and disinfection of water lines.

C. Water for construction is located at the following locations:
   1. Water is available for purchase from the Eldorado Area Water and Sanitation District (EAWSD), City of Santa Fe, or Santa Fe County. The closest point within Santa Fe County water system to the project site is just southeast of Santa Fe Community College near the Rancho Viejo development.
   2. Other Water Supply Sources: Water is also available from private water suppliers. Contractor is responsible for identifying private water suppliers and for arranging purchase of water from these suppliers, at no additional cost to Owner.

1.10 TIME EXTENSIONS FOR ABNORMAL AND UNFORSEEABLE WEATHER (ADVERSE WEATHER DELAYS)

A. This provision specifies the procedure for the determination of time extensions for abnormal and unforeseeable weather. In order for the Engineer to award a time extension under this clause, the following conditions must be satisfied:
   1. The weather experienced at the project site during the contract period must be found to be unusually severe; that is, more severe than the adverse weather anticipated for the project location during any given month.
   2. The abnormal and unforseeable weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

B. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather-dependent activities.

Monthly Anticipated Adverse Weather Delay
Work Days Based on 5-Day Work Week

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
3	2	1	1	1	1	3	3	3	3	1	2

C. An actual adverse weather day must prevent work for 50% or more of the Contractor's workday, delay work critical to the timely completion of the project, and be documented by the Contractor. The Owner's representative observing the construction shall determine on a daily basis whether or not work can proceed on a given date, within 2 calendar days of that date. The Owner will use the above-written notification in determining the number of working days for which work was delayed during each month.

D. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in Paragraph 1.10 B, the Engineer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECTION (NOT USED)

END OF SECTION

SECTION 01 14 02

UTILITY OBSTRUCTIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. General provisions for handling utility obstructions and relocations.

1.02 UTILITIES SHOWN ON DRAWINGS

A. The Engineer has made reasonable efforts to show the general location of existing underground and overhead utility lines on the Drawings; however, Contractor shall recognize that buried utilities may not be in the locations shown on the Drawings, or there may be other utilities that are not shown on the Drawings.

1.03 CONTRACTOR RESPONSIBILITIES

A. For excavation work in New Mexico, Contractor is responsible to comply with the New Mexico Excavation Law (NMEL), as published in New Mexico Statutes Annotated (NMSA) 1978, section 62-14. Section 62-14-3 of the law requires the excavating Contractor to:
   1. Call the local notification center of NM811 One-Call in advance of excavating.
   2. NM811 One-Call will notify utility owners or operators to locate and mark their utilities.
   3. Notify directly all utility owners or operators who are not members of the local one-call center to locate and mark their utilities.
   4. In general, any utility located on the Owner's plant or station property belongs to the Owner past the utility meter or other termination point. The Owner is responsible to locate and mark such utilities.
   5. Do not start excavation until all utility owners have located and marked their utilities.
   6. Do not use mechanical excavation equipment, including bores and plows, within 18-inches horizontally of the utility marks (tolerance zone) until the Contractor exposes the utility by non-mechanical means such as hand digging or vacuum/dry type potholing.
   7. Repair any damage to utilities caused by Contractor, and report to utility owner and NM811 One-Call.

B. Comply with requirements of Section 01 12 16 – Work Sequence.

C. This work will be considered incidental Work to the Contract Documents' Bid Items.

1.04 RELOCATION OF OVERHEAD UTILITIES

A. Determine in advance of construction operations if overhead utility lines, support structures, poles, guys, etc., whether shown on the Drawings or not, will obstruct construction operations. If any obstruction to construction operations is evident, coordinate with the appropriate utility company to remove or relocate the utility obstructions. Any charges by any utility company for removal or relocation of overhead utilities are the sole responsibility of the Contractor at no additional cost to the Owner.

1.05 RELOCATION OF UNDERGROUND UTILITIES

A. Determine in advance of construction operations locations of all underground utilities (gas, telephone, fiber optic cable, electrical, cable TV, water, sewer), whether shown on the Drawings or not, that may interfere with Contractor's construction operations.

B. All Underground Utilities Except Water and Sewer Lines: Coordinate with the appropriate utility company to remove or relocate the existing utilities which interfere with construction. Utility company charges for relocating these existing utilities will be paid from the utility line relocation allowance listed on the Bid Proposal.

C. Water and Sewer Lines:
   1. Adjust alignment on any waterline which Contractor is constructing to avoid existing underground utility lines and/or to maintain a minimum three feet of cover; Take other measures necessary (encasement of water or sewer line, change of pipe material, etc.) to protect new and existing lines.
   2. Adjust alignment of all existing waterlines as appropriate or required to avoid interference with:
      a. new sewer lines, or;
      b. new structures, or;
      c. new roadway, or;
      d. to maintain at least three feet of cover over existing waterlines unless otherwise approved in writing by Engineer.
   3. Incidental work to be performed at no additional cost to Owner: All work required to adjust alignment of new waterlines around any existing waterlines or sewer lines, or other measures necessary to protect new and existing lines.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 14 03

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 APPLICABLE CODES AND ORDINANCES

A. All Work shall conform to the current versions of all applicable building, mechanical, plumbing, and electrical codes.

B. Contractor is responsible for acquiring all applicable building, mechanical, plumbing, and electrical permits related to this project.

C. Comply with all local laws, ordinances, and regulations which may impact Contractor's work.

1.02 OSHA REQUIREMENTS

A. All equipment and facilities provided, including but not limited to, handrails, guardrails, grating, hoists, equipment guards, ladders, etc., shall meet OSHA requirements whether or not such requirements are specifically indicated or described in the Contract Documents.

B. Any conflicts between OSHA requirements and Contract Documents shall be brought to the attention of the Engineer on a timely basis for resolution.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 14 16.01

COORDINATION WITH PUBLIC AND UTILITY INTERRUPTIONS

PART 1 GENERAL

1.01 PUBLIC ACCESS

A. Provide for continuous public access to all residences, businesses, and properties via existing roads, alleys, and driveways whenever practical.

B. Provide alternate public access to all residences, businesses, and properties in coordination with affected residents and occupants when existing access arrangements must be disrupted by Contractor's work whenever practical.

C. Notify public at least three (3) calendar days in advance of interrupting public access.

1.02 UTILITY INTERRUPTIONS

A. Coordinate any water shut-off operation with the Owner not less than three (3) working days prior to initiating any work affecting existing water utilities. Limit water service shut-off to four (4) hours. Keep Owner informed of work areas on a daily basis, and specifically notify Owner of areas where fire hydrants will be out of service.

B. Notify all customers at least three (3) calendar days in advance of interrupting utility service.

C. Keep interruptions of utility service at a minimum as to number of users and duration.

1.03 NOTICES

A. Construction Notices Before Construction:
   1. Delivered not more than seven (7) calendar days nor less than four (4) calendar days prior to actual physical construction on each line or line segment.
   2. Corrected notices delivered if construction does not start within 48 hours of date given in notice.
   3. Written notice to state:
      a. Contractor's name, address, and local telephone number.
      b. Nature of work to be done.
      c. Disruption residents or businesses might expect.
      d. Expected duration of construction.
      e. Contractor's local telephone number to which complaints may be made during normal working hours.
      f. Contractor's local telephone number to which emergency conditions can be reported during non-working periods.

B. Construction Notices After Construction:

1. Delivered not more than seven (7) calendar days following construction on each line or line segment.
2. Written notice to state:
   a. Contractor's name, address, and telephone number.
   b. Thank residents and businesses for cooperation and report work is completed in applicable area.

C. Special Notices:

1. Inform residents and businesses personally and by written notice whenever access to property will be impaired or utility service will be interrupted, stating scheduling of such action.

D. Notice Delivery:

1. Hand delivery to each resident and business adjacent to or which may be reasonably expected to be affected by construction.
2. Do not deliver notices in mail boxes or mail slots. Use other delivery methods such as door hangers.

1.04 SCHEDULE OF SPECIAL REQUIREMENTS FOR THIS PROJECT

A. Provide all notices included above.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED

END OF SECTION

SECTION 01 14 19

USE OF SITE

PART 1 GENERAL

1.01 AVAILABLE SITES

A. Sites and easement limits available for the construction of the project are shown on the Drawings. Contractor shall not utilize any land not indicated as being available without the written approval of the applicable land owner.

B. If the Contractor requires the entire width of right-of-way or easement for construction, it shall be the Contractor's responsibility to have a licensed land surveyor establish the right-of-way line where it is not apparent.

1.02 PROTECTION AND RESTORATION

A. All existing features and improvements to or on easements shall be restored by the Contractor equivalent to those existing prior to construction at no additional cost to the Owner. Compliance with special requirements or considerations indicated on the Drawings for the use of easements shall be the Contractor's responsibility at no additional cost to the Owner.

B. Trees within construction easement shall be preserved to maximum practical extent, unless specifically indicated in the Drawings.

1.03 SPECIAL CONSTRUCTION METHODS

A. Special and hand construction methods may be required to remain within the available easements. Such methods shall be used by the Contractor at no additional cost to the Owner.

B. Other Contractors could be working on related work at or near the site; therefore, the Contractor is expected to cooperate and provide adequate access to all other working parties at or near the site.

1.04 STAGING AREAS

A. Staging area is not provided by the Owner. Locating staging area(s) on private land is the responsibility of the Contractor. Contractor staging areas shall be provided by the Contractor at no additional cost to the Owner. Contractor staging areas are to be considered incidental Work to the Contract Documents' Bid Items.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 21 00

ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedure for administration of Allowances.

1.02 RELATED REQUIREMENTS

A. Individual Technical Specification sections listed under “Schedule of Allowances” at the end of this Section.

1.03 ALLOWANCE

A. The allowance is a sum of money included in the Contract Price to cover the cost of a service, all inclusive, to be provided under the Contract by a party other than the Contractor.

B. The allowance is included in the Bid Form.

C. The sum of an allowance is an estimated amount.

D. The Contractor will be reimbursed only for the costs invoiced by the party providing the service, and no mark up, such as overhead and profit shall be charged by the Contractor.

E. Services may be less than, equal to, or greater than, the estimated allowance amount. Contractor will be paid only the actual cost of the services.

1.04 ADJUSTMENT OF BONDS AND INSURANCE

A. Adjustment to Contractor’s bonds and insurance on account of adjustment to allowance will only be dealt with in the final pay application considering the final cost of the project in comparison to the Bid Price.

1.05 SCHEDULE

A. A Schedule of Allowances for this Contract is included at the end of this Section.

1.06 ENGINEER RESPONSIBILITIES

A. Consult with Contractor in consideration of supplier of services.

1.07 CONTRACTOR RESPONSIBILITIES

A. Execute purchase agreement with designated supplier.

B. For additional information, refer to specific specification sections referenced in Schedule of Allowances.

1.08 PAYMENT PROCEDURES

A. Payment will be made under the Bid Item for the specified Allowance.

B. Contractor submit invoices on a monthly basis with pay application.

C. Pay application will not be accepted without invoices for allowance services performed during the pay application pay period.

D. Pay invoice on approval of Engineer.

1.09 SCHEDULE OF ALLOWANCES

A. Utility Relocation: Allow the amount of $10,000.00. For additional information, see Section 01 14 02 – Utility Obstructions and Bid Form.

B. Laboratory Testing Allowance: Allow the amount of $15,000.00. For additional information, see Section 01 45 23 – Testing Laboratory Services and Bid Form.

C. Environmental Monitoring: Allow the amount of $85,000.00. For additional information, see Bid Form.

D. Pre-authorized Changes During Construction Allowance: Allow the amount of $25,000.00. Changes to Work are governed under the Change Order provisions of the Contract Documents. If the cumulative price of Changes to Work total less than the Pre-authorized Changes During Construction Allowance, the Contract Price will be adjusted. For all Changes to Work in excess of the allowance amount, the Contract Price will be adjusted.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. For the purposes of this Specification Section, the terms “material and equipment” and “Products” have the same meaning and are used interchangeably.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract

1.03 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Contractor’s Options:
1. For Products specified only by reference standard, select any product meeting that standard.
2. For Products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.
3. For Products specified by naming one or more Products or manufacturers and “or equal”, “or Engineer approved equivalent”, or “Engineer reviewed equivalent”, or similar term, Contractor shall submit a request as for substitutions for any Product or manufacturer not specifically named. The use of brand names is for the purpose of describing the standard of quality, performance and characteristics desired, and is not intended to limit or restrict competition.
4. For Products specified by naming only one Product and manufacturer, there is no option. This is usually done in cases where the Owner has standardized on previously purchased products and spare parts at its facilities, and needs to maintain consistent training, operation, and maintenance programs.

B. Substitutions:
1. For a period of 30 days after the Preconstruction Conference, Engineer will consider written requests from Contractor for substitution of Products.
2. Submit a separate request for each Product, supported with complete data, with drawings and samples as appropriate, including:
   a. Comparison of the qualities of the proposed substitution with that specified.
   b. Changes required in other elements of the work because of the substitution.
   c. Effect on the construction schedule.

d. Cost data comparing the proposed substitution with the Product specified.
e. Any required license fees or royalties.
f. Availability of maintenance service, and source of replacement materials.

3. Engineer shall be the judge of the acceptability of the proposed Product substitution.

C. Contractor's Representation:

1. A request for a Product substitution constitutes a representation that Contractor:
   a. Has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified.
   b. Will provide the same warranties or bonds for the substitution as for the Product specified.
   c. Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects. Upon request, submit to Engineer to-scale dimensioned electronic drawing files of the specific model of the requested substituted equipment items. Drawings shall show general arrangement plan and sections. Drawing files shall be in AutoCAD .dwg format.
   d. Waives all claims for additional costs or contract time, under his responsibility, which may subsequently become apparent.

D. Engineer will review requests for substitutions with reasonable promptness, and notify Contractor, in writing, of the decision to accept or reject the requested substitution.

1.04 INTENT OF TECHNICAL SPECIFICATIONS

A. Since the specified materials and details of equipment and component fabrication and assembly are given for specific functional, operational, maintainability, and compatibility reasons, which are not detailed in the Contract Documents, any substitution shall provide the functional intent as well as the specified intent in all details, as determined by the Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Measurement and Payment.

B. Schedule of Values.

C. Application for Payment.

1.02 ADDITIONAL REQUIREMENTS

A. Agreement and corresponding Bid.

B. Conditions of the Contract: Progress payments and final payments.

1.03 MEASUREMENT AND PAYMENT

A. Unit Price Items:
1. Estimated Quantities:
a. Estimated quantities in Bid Form are approximate and used only for:
1) Basis for estimating probable cost of Work.
2) Comparison of Bids submitted for Work.
b. Actual Work done or materials furnished under Unit Price item may differ from estimated quantities.
c. Basis of payment: Actual amount of Work as determined by applying the appropriate Unit Price as Bid.
2. Water Line Main in Place:
a. Unit Price per lineal foot for each item of Work to include all costs, unless otherwise specified.
b. Includes all trenching, backfilling, compaction, testing, and disinfection.
c. Includes all fittings required for the Work, whether or not shown, except valves.
d. No extra payment for dewatering, rock excavation, select backfill, shoring, bracing or other attendant work, unless specifically provided in the Bid Schedule.
3. Trenching and Backfilling:
a. Unit Price Bid per lineal foot for each item of Work to include all costs, unless otherwise specified.
b. All Trenching Unclassified: The Bid Unit Price applies equally for any conditions encountered and any obstructions encountered for which separate Bid Items are not included in the Contract.

c. Trenching Requiring Rock Excavation: The Bid Unit Price applies equally for trenching required for waterline installation where rock excavation is required. Rock shall be defined in Section 31 23 18 – Rock Excavating of the Technical Specifications. Payment will be made under the conditions that rock is observed mutually by the Contractor and Owner's representative or proved by the Contractor as stated in Technical Specification 31 23 18 – Rock Excavating.

d. Depth of Trench: Height between existing ground surface and invert of pipe based on survey cut sheets.

e. No progress payments for lengths of trench that have not been backfilled as specified.

f. No extra payment will be made for dewatering, rock excavation, sheeting, shoring, bracing or other attendant work, unless specifically provided in the Bid Schedule.

g. No payment for trenching and backfilling until corresponding pipe in place is acceptable.

4. Special Bedding or Encasement Where Specifically Indicated on Drawings.

a. Payment to include all Work and materials and is in addition to amount for trenching and backfilling and for pipeline.

5. Crossing:

a. Each crossing itemized in the Bid Schedule shall be paid as lump sum amount.

b. Amount to include all Work or material required for complete ready to use installation.

6. Removal and Replacement:

a. When itemized in the Bid Schedule, payment to include all work and materials including removal, hauling and disposal, and replacement.

b. Pavement:

1) Payment for trench pavement replacement to be to the limits specified in Section 32 09 00 – Removal and Replacement of Existing Surfaces, or as indicated on Drawings.

2) Payment for pavement replacement required for water service line connections and water meter installations shall be incidental to each connection detail.

c. Sidewalks:

1) There will be no additional payment for replacement of sidewalks unless itemized on Bid Schedule.

d. Gravel Surfaces: There will be no additional payment for replacement of gravel surfaces unless provided for on Bid Form.

7. Other Unit Price Items:

a. Unit complete in place and ready for use including all Work.

B. Lump Sum Items: Payment for all lump sum bid items includes all Work, labor, and materials required to provide a complete ready to use installation.

C. Materials:

1. Payment for materials delivered but not fully incorporated in project only made if such materials are included in the Schedule of Values and if such materials are available for inspection at Contractor's jobsite yard.
2. For small projects for which a schedule of values is not required, payment for materials delivered but not fully incorporated in the project will only be made if such materials are available for inspection at Contractor's jobsite yard, and for which invoices are presented to Engineer.
3. Payment for materials delivered but not fully incorporated into the project is only allowed if made without any Contractor markup or any other associated fees.

D. Allowance Items: Contractor's actual costs for allowance items listed in Section 01 21 00 – Allowances based on invoices received for actual time and materials expenses.

E. Incidental Work:

1. All Work, labor, materials, appurtenances, activities, and requirements to complete the facilities complete in place and ready for use, and to comply with all requirements and conditions of the Contract Documents are considered incidental Work to the Contract Documents' bid items. No separate, additional or special payment will be due the Contractor for incidental Work.
2. Above, on, or below ground obstructions, utilities, features or improvements which interfere with the Work or which must be moved, removed and/or restored to accomplish the Work are considered as incidental Work for which separate payment will not be made if separate bid items or allowances are not specifically given for such in the Contract Documents.
3. Striping centerline shall be considered incidental to the paving and, therefore, no separate measurement or payment will be made unless there is a specific bid item for such.
4. Field survey of existing roadway prior to removal of asphaltic paving.
5. Traffic control work, signs, and devices unless otherwise specifically provided in the Bid Schedule.
6. New permanent traffic signing, if shown on Drawings, unless otherwise specifically provided in the Bid Schedule.
7. Final adjustment of existing or new manhole rims, water valves, water meter lids, and fire hydrants to new finished grade, unless otherwise specifically provided in the Bid Schedule.
8. Removal and/or replacement of sidewalk, curb and gutter, driveway pavement, medians, and gravel surface are considered incidental to work unless otherwise specifically provided in the Bid Form.
9. Reclamation seeding.
10. Pipe identification tape and marker posts.
11. Repair of existing water service lines of 1-inch and smaller.
12. Repair of existing sewer service laterals of 4-inch and smaller.
13. All clearing and disposal costs.

14. Compliance with requirements of storm water discharge permit as specified by USEPA and as specified in these Contract Documents.
15. Preparation of shop drawings prior to delivery of materials.
16. Water bacteriological testing for disinfection of domestic water systems other than water wells.

F. Operation and Maintenance Manual: For equipment requiring operation and maintenance manuals, no payment for installation of said equipment will be made to the Contractor until final operation and maintenance manuals have been submitted and accepted by the Engineer.

G. Mobilization, Insurance and Bonds: Bid Item amount is shown on the Bid Form.

H. Demobilization and Submittal of All Closeout Documents: Bid item is shown on the Bid Form. Fifty percent of bid item will not be paid until Contractor has completed all closeout submittals to Engineer as specified in Section 01 77 00 – Contract Closeout.

1.04 SCHEDULE OF VALUES

A. Requirements Included:
1. Submit to the Engineer a Schedule of Values allocated to the various portions of the Work, within 15 days after start of Contract Time.
2. Upon request of the Engineer, support the values with data which will substantiate their correctness.
3. The Schedule of Values, unless objected to by the Engineer, shall be used only as the basis for the Contractor's Application for Payment.

B. Form and Content of Schedule of Values:
1. Type schedule on 8.5" x 11" white paper; Contractor's standard forms and automated printout will be considered for approval by Engineer upon Contractor's request. Identify schedule with:
   a. Title of Project and location.
   b. Engineer and Project number.
   c. Name and address of Contractor.
   d. Contract designation.
   e. Date of submission.
2. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction. Schedule shall include all Work shown on Drawings and indicated in Specifications. Schedule shall be subdivided by categories with subtotals shown for each bid item listed in the Bid.
3. Follow the table of contents of this Project Manual as the format for listing component items.
   a. Identify each line item with the number and title of the respective major section of the specifications.

b. List items paid via allowances separately from the rest of the Work and at the end of the Schedule.

4. For each major line item list sub-values of major products or operations under the item.
5. Each of the various portions of the Work (excluding allowance items) listed in the Schedule of Values shall include a directly proportional amount of the Contractor's overhead and profit.
6. The unit values of the materials or equipment for which progress payments will be requested prior to installation and demonstration shall be broken down into:
   a. Cost of the material or equipment, delivered and unloaded at the site, with taxes paid.
   b. Installation costs, including Contractor's overhead and profit.
   c. Shakedown and demonstration of equipment and/or systems.
   d. Operator training and/or manufacturer's inspection and/or certifications if required.
7. The unit quantity for bulk materials shall include an allowance for normal waste.
8. The sum of all values listed in the schedule shall equal the total amount of Contract.
9. No payment will be made exclusively for Contractor's preparation of submittals.

1.05 APPLICATIONS FOR PAYMENT

A. Requirements Included:
   1. Submit Applications for Payment to Engineer in accordance with the schedule established by conditions of the Contract and Agreement between Owner and Contractor.

B. Format and Data Required:
   1. Cover and Signature Page: As provided by Engineer.
   2. Sheet Size: 8.5" x 11" or 8.5" x 14".
   3. Payment Items: Follow approved schedule of values.
   4. Preparation: Typed or machine printed.
   5. Columns Included:
      a. Bid or Payment Item (from Schedule of Values).
      b. Unit.
      c. Contract:
         1) Contract or scheduled unit price.
         2) Quantity.
         3) Total price.
      d. Previously completed:
         1) Quantity.
         2) Total price.
      e. Completed This period:
         1) Quantity.
         2) Total price.

f. Total to Date:
   1) Quantity.
   2) Total price.

6. Contractor's standard format can be used if it meets these requirements or is approved by the Engineer.
7. Submit draft payment applications electronically in Microsoft "EXCEL" spreadsheet format to Engineer for review. Include all supporting documents in e-mail to Engineer. Note: Payment applications in .pdf format for review purposes are not allowed.

C. Preparation of Application for Each Progress Payment:
1. Application Form:
   a. Fill in required information, including that for Change Orders executed prior to date of submittal of application.
   b. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.
   c. Execute certification with signature of a responsible officer of Contract firm.
2. Continuation Sheets:
   a. Fill in total list of all scheduled component items of Work, with item number and scheduled dollar value for each item.
   b. Fill in dollar value in each column for each scheduled line item when Work has been performed or products stored.
   c. List each Change Order executed prior to date of submission, at the end of the continuation sheets.
   d. List by Change Order Number and description, as for an original component item of Work.
3. Limits of Payment for partially complete Water Line:
   a. Not to exceed 80% of Unit Price for sections of line for which trench compaction tests and finish grading of the trench are complete but pressure testing has not been successfully completed.
   b. Not to exceed 90% of Unit Price for sections of line for which disinfection has not been successfully completed.

D. Substantiating Data for Progress Payments:
1. Submit with each copy of application:
   a. Properly identified invoices supporting requests for materials payments.
   b. Properly identified invoices for inspection testing allowance payments.
   c. Labor standards certificate in accordance with example form to be provided by Engineer.
   d. If required by Engineer, certificate of payment of all suppliers and subcontractors for which payment has previously been received from Owner, in accordance with example form to be provided by Engineer.
   e. Copy of construction schedule showing progress to date.

E. Preparation of Application for Final Payment:

1. Fill in application form as specified for progress payments.
2. Provide certificate of payment of all suppliers and subcontractors.
3. Provide release of lien certificates from all subcontractors.

F. Submittal Procedure:

1. Review quantities and obtain concurrence of Engineer's field representative before submission.
2. Submit Applications for Payment to Engineer at the times stipulated in the Agreement.
3. Number: Seven printed copies of each final, executed application, unless otherwise agreed to at the Pre-Construction Conference.
4. When Engineer finds Application properly completed and correct, he will transmit certificate for payment to Owner, with copy to Contractor.

PART 2 PRODUCT (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 GENERAL

1.01 MEETINGS

A. Contractor to attend at no additional cost to Owner.

B. Preconstruction conference to be scheduled by Engineer.

C. Progress or special meetings as deemed necessary and scheduled by Owner or Engineer.

D. Special and final inspections by Owner or Engineer when requested.

1.02 SCHEDULE OF SPECIAL REQUIREMENTS FOR THIS PROJECT

A. Contractor responsible for preparing progress meeting agenda and distribution of meeting notes at no additional cost to Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 13

CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Promptly after award of the Contract, prepare and submit to Engineer estimated initial baseline construction progress schedules for the Work.

B. Submit revised progress schedules.

C. Schedule subject to approval of Engineer.

D. Schedule construction working hours.

1.02 FORM OF SCHEDULES

A. Basis of Schedule: Critical path network analysis of construction activities.

B. Format of Graphic Display of Schedule Submitted to Engineer:
1. Gantt horizontal bar chart as a printed copy or in .pdf electronic file format, as specified herein.
2. Horizontal Time Scale: Identify the first work day of each week.
3. Provide separate horizontal bar for each activity. In general, subdivide activities into sub-activities having durations no more than 15 working days, so that progress can be easily tracked.
4. List the activities in chronological order according to the start date of each activity.
5. Indicate durations and start/stop dates for each activity.
6. Indicate the predecessor and successor activities for each activity.
7. Identify which activities are on the critical path.

1.03 CONTENT OF SCHEDULES

A. Activities: Show the complete sequence of construction by activity.
1. Include activities for:
a. Preparation of submittals for major equipment items.
b. Procurement of major equipment items.
c. Mobilization.
d. Preparation of operation and maintenance manuals for major equipment items.
e. Shakedown/startup testing.
f. Punchlist work.
g. Preparation of closeout documents.

h. Any sequence or scheduling constraints specified in Section 01 12 16 – Work Sequence.

B. Milestones: Indicate milestone dates for:
1. Notice to Proceed.
2. Notice of Substantial Completion.
3. Final Completion.

1.04 PROGRESS REVISIONS

A. Indicate effective date of revision and show progress of each activity to date of submission.

B. Show changes occurring since previous submission of schedule:
1. Major changes in scope.
2. Activities modified since previous submission.
   a. Revised projections of progress and completion.
   b. Revised critical path activities.
   c. Other identifiable changes.

C. Provide a narrative report as needed to define:
1. Problem areas, anticipated delays, and the impact on the schedule.
2. Corrective action to be taken.

1.05 SUBMISSIONS

A. Submit initial baseline schedules within 15 days after start of Contract Time.
1. Engineer will review schedules and return review comments within 10 days after receipt.
2. If required, resubmit within 7 days after return of review copy.

B. Submit updated schedules to show actual progress of Work with each application for payment: Section 01 29 00 – Payment Procedures.

C. Submit revised progress schedules when requested by Engineer or whenever project is more than 5% behind approved schedule as determined by monthly request for payment.

1.06 DISTRIBUTION

A. Distribute copies of the initial baseline and monthly updated schedules as follows:
1. Engineer’s Review Copy: One printed copy or electronic file in .pdf format.
2. Engineer’s Record Copy: Four printed copies.

1.07 CONSTRUCTION WORKING HOURS SCHEDULING

A. Notify Engineer at least 48 hours in advance of any work to be done outside of usual working hours or any change in usual working hours.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop Drawings

B. Product Data

C. Samples

D. Contractor Responsibility

E. Engineer Responsibility

F. Schedule of Submittals

1.02 RELATED WORK/REQUIREMENTS SPECIFIED ELSEWHERE

A. Conditions of the Contract: Definitions and Additional Responsibilities of Parties

1.03 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner.
   1. Sufficient detail to show kind, size, and arrangement and function of component materials and devices.

B. Minimum sheet size: 8-1/2” x 11”

1.04 PRODUCT DATA

A. Preparation:
   1. Provide information required in individual Sections.
   2. Where sheets are reproduced from a pamphlet, catalog, or similar publication, print the manufacturer’s name and the title of the publication on each sheet, or set of sheets, if it is not already on the sheet.
   3. Clearly mark each copy to identify applicable products or models by both neatly encircling pertinent data and marking the circle with an arrow or by crossing out all extraneous data, with black, indelible ink. Do not use highlighter because it will not reproduce well.
   4. For items that may be installed at multiple locations throughout the project, such as pipe materials, valves, other pipe appurtenances, and field coatings, indicate in a cover letter where each item is intended to be installed.
   5. Show performance characteristics and capacities.

6. Show dimensions and clearances required.
7. Indicate weights of major components.
8. Indicate materials of construction.
9. Do not prepare submittal materials from facsimile (FAX) copies of product data unless specifically authorized by Engineer.
10. Material described on Drawings but not shown in the Specifications: Provide cut sheets as a minimum, or as called for on the Drawings.

B. Installation data for all materials and equipment for which operation and maintenance manuals will not be provided. Also provide installation data with shop drawing prior to delivery of equipment, if specified in the equipment Section.
1. Provide manufacturer's installation instructions and recommendations.
2. Provide referenced standards for installation.

C. Manufacturer's standard schematic drawings, diagrams, descriptions and information:
1. Modify to delete information that does not apply to Work.
2. Supplement to provide information specifically applicable to the Work.

1.05 SAMPLES

A. Samples shall be of sufficient size and quantity to clearly illustrate:
1. Functional characteristics of the project, with integrally related parts and attachment devices.
2. Full range of color, texture, and pattern.

B. Include identification on each sample, with full project information.

1.06 CONTRACTOR RESPONSIBILITIES

A. If substitutions of materials are proposed, conform to Section 01 25 00 – Substitution Procedures.

B. Submit exactly the required quantity of materials.

C. Review Shop Drawings, Product Data, Certificates, Electrical Schematics, Electrical Connection Diagrams, Test Reports, Installation Instructions, Samples, and similar required submittal materials for completeness and accuracy prior to submission. Return unsatisfactory submittal materials to the supplier or manufacturer for correction.

D. Determine and Verify:
1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance with Specifications.
5. Conflicts with other items of construction past, present, or future.
6. Submittal materials are legible.

E. Coordinate each submittal with requirements of the Work and of the Contract Documents.

F. Notify the Engineer in writing, at time of submission, of any deviations in submittal from Contract requirements.

G. Begin no fabrication or work that requires submittals until return of submittals with Engineer's final review.

1.07 SUBMITTAL PROCEDURES

A. Make submittals promptly and in such sequence as to cause no delay in the Work.

B. Execute and attach “Contractor Submittal Form” to each submittal. Sample form is attached to the end of this Section. Sign, date, and forward the Form and the Contractor reviewed submittal materials to the Engineer.

C. Number submittals by respective section number followed by an “S” for submittals, “P” for preliminary O&M, and “F” for final O&M.

D. Include a copy of the respective Specification Section(s). For each paragraph of the Specifications, confirm that the submittal complies and include a tab and sheet number where the information can be found for each paragraph of the Specification. If the submittal does not comply with a paragraph, identify as such and provide an explanation why it does not. If this information is not provided with each submittal and preliminary O&M, then the Engineer will return as “Not Reviewed”. Final O&Ms are excluded from this requirement.

1.08 RESUBMISSION REQUIREMENTS

A. Make corrections/changes in the submittals to comply with comments made by the Engineer and resubmit until final review.
   1. Attach Engineer’s comments from previous submittal annotated with action taken in the current submittal.

B. Number resubmittals as identified in paragraph entitled “Submittal Procedures”, and follow with a numeric value which identifies the number of resubmittals pertaining to that specific submittal.

C. Shop Drawings and Product Data:
   1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
   2. Indicate any changes that have been made other than those requested by the Engineer.

D. Samples: Submit new samples as required for initial submittal.

E. Specifically direct attention in writing to revisions other than the corrections called for by the Engineer on previous submittals.

F. Include a copy of previous “Contractor Submittal Forms”.

G. Include a copy of previous Engineer’s comments, marked to show Contractor’s responses. If not provided, submittal will be returned as “Rejected/Resubmit.”

H. Furnish all applicable information in the resubmittal, including information on material that was favorably reviewed. Upon request, the Engineer will return all but one of the original submittals for reuse by the Contractor.

I. Partial resubmittals are allowed, but following favorable review of the partial resubmittal, provide complete resubmittals including all favorably reviewed material.

1.09 DISTRIBUTION

A. Copy and distribute submittals returned by Engineer marked “No Exception Taken” or “Make Corrections Noted”:
   1. Job site file.
   2. Job site record documents file.
   3. Subcontractors and suppliers as appropriate.

B. If returned by Engineer, distribute samples marked “No Exception Taken” or “Make Corrections Noted” as directed by the Engineer.

1.10 ENGINEER RESPONSIBILITIES

A. Review submittals with reasonable promptness as specified herein in the Timeliness subsection.

B. Return submittals with completed Contractor Submittal Form with signature and attach review comments if needed.

C. Return one copy of submittal to Contractor.

D. Submittal Review Status Categories:
   1. “NO EXCEPTION TAKEN” – Reviewed for general conformity to the requirements of the Contract Documents. Quantities shown not verified. Contractor’s full responsibility is in no way relieved by this action.
   2. “MAKE CORRECTIONS NOTED” – Reviewed and noted for general conformity to requirements of the Contract Documents. Quantities shown not verified. Contractor’s responsibility is in no way relieved by this action. Resubmittal is not required, provided Contractor concurs with, accepts, and complies with A/E’s comments.
   3. “REVISE & RESUBMIT” – Reviewed and not accepted. Provide missing information, make corrections as noted, and resubmit full submittal.

4. “REJECTED/RESUBMIT” – Reviewed or partially reviewed and not accepted. Resubmit information in conformance with the Contract Documents.
5. “RECEIPT ACKNOWLEDGED” – Submittal for Section is not required or submittal is being held by A/E for coordination of work with that of another Section.

E. Return submittals with only cursory review and marked “Revise & Resubmit” or “Rejected/Resubmit” when:
1. It becomes apparent the submittal is not acceptable,
2. The submittal has not been thoroughly reviewed by the Contractor,
3. Submittal does not cover all of a Section,
4. Submittal improperly contains information for more than one Section, or
5. Submittal is illegible.

F. Return resubmittals only containing partial information.

G. Discard submittal copies in excess of those scheduled.

1.11 LIMITS OF ENGINEER’S RESPONSIBILITY

A. Engineer’s review does not constitute acceptance or responsibility for accuracy of dimensions or quantities.

B. Engineer’s review does not relieve the Contractor from meeting requirements of the Contract Documents.

C. Engineer’s review does not constitute approval for any deviation from the Contract Documents unless such deviations are specifically stated as such on the submittal and specifically allowed by the Engineer by specific written notification for each such variation.

D. Engineer’s review does not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the Contractor’s Responsibilities portion of this Section.

E. Engineer’s review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 PAYMENT AND TIME FOR REVIEW OF EXCESSIVE SUBMITTALS

A. Submittals after first resubmittal:
1. Owner will charge Contractor for all of Engineer’s review time and costs at Engineer’s standard billing rates through a credit by Change Order.
2. Reviewed by Engineer at convenience of the Engineer.

1.13 FORMAT

A. Furnish individual submittal packages for each Section. Include a separate Contractor Submittal Form for each Section.

B. The Contractor may elect to make a single submittal for all Sections supplied by a single manufacturer/supplier. Such single submittal must conform to the following:
   1. Index the submittal with tabs with one and only one Section under a single tab.
   2. Include a separate Contractor Submittal Form for each Section.
   3. Identify submittal packages on the front or on the first page with the Owner's name, the project name, the Contractor's name, the subcontractor's name, the date, and the contents of the binder, including the Specification Section(s), title(s), and number(s).

C. Minimum Acceptable Binding Methods:
   1. Submittals of no more than six sheets per set, including cover sheets: Staple in sets.
   2. Submittals of seven to 25 sheets per set: Punch sheets and assemble in a soft-cover binder with 3-hole metal fold-down clips to hold pages or in a ring binder.
   3. Submittals of 26 to 75 sheets: Punch sheets and assemble in a hard-cover ring binder.
   4. Submittals of more than 75 sheets: Punch sheets and assemble in a hard-cover D-ring binder.
   5. Fold 11" by 17" drawings to fit into bound sets of submittals.
   6. Furnish drawings larger than 11" by 17" folded and inserted in pockets in the binders. Provide a complete index in the submittal literature set.

1.14 TIMELINESS

A. As a minimum, the Contractor shall allow the following number of calendar days for submittal process:

	Engineer's Review Time
Initial Submittal	14
Resubmittal	7
Operation and Maintenance Manuals	16

   1. Engineer's Review Time is the time the submittal is in the Engineer's office.
   2. The Engineer will process first those items with higher priority based on a written request from the Contractor.

B. Turnaround time for complex submittals (such as process equipment systems with multiple components, mechanical systems, electrical equipment, instrumentation control systems, and electrical process and instrumentation drawings) may exceed the total indicated in 1.14A.

C. Materials, equipment, supplies, or labor to install such materials or equipment for which submittals have not been marked “No Exception Taken” or “Make Corrections Noted” are not eligible for payment and such materials and equipment shall not be allowed on the job site.

1.15 PROJECT RECORD DOCUMENTS

A. If the equipment installed deviates in any way from the submittal for the equipment, then submit copies of submittals that are corrected to show actual equipment supplied.

1.16 ATTACHMENTS TO THIS SECTION

A. Contractor Submittal Form

1.17 REQUIRED SUBMITTALS

A. Quantity, submit in **one** of the following formats:
   1. Electronic Format:
      a. Submittals in electronic searchable .pdf format are allowed.
      b. Engineer’s submittal review will be returned to Contractor in electronic format.
      c. After an electronic submittal is accepted by the Engineer as final, submit one (1) printed copy to Engineer to retain for field use.
      d. Any additional printed copies received will be discarded by Engineer.
      e. Refer to Section 01 78 39 – Project Record Documents for submittal of one printed record set of submittals at Contract close-out.
   2. Or Printed Format:
      a. For submittals in printed format only, submit five (5) copies. Engineer will retain four (4).
      b. Engineer will return one (1) copy to Contractor.
      c. Any additional copies received will be discarded by Engineer.

B. See individual Specification Sections for description of required submittals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

#	CONTRACTOR SUBMITTAL FORM	
Specification No. Title/Description:	Project: **Canoñcito Regional Water System Improvements Phase II**	Contractor's Submittal No.: Date: Product Description:
	CONTRACTOR:	Dates of any previous submissions:
	Subcontractor / Supplier:	Manufacturer:
	Specification No.:	Drawing Nos.:
	Are there any deviations to the Contract Documents? ☐ No ☐ Yes (Explain and Identify:)	

Undisclosed deviations/modifications do not relieve the Contractor from the obligation to provide the specified product and detail of installation, and may be cause for rejection of the Work. Deviations and modifications must be listed here or in a separate Request for Substitution.

CONTRACTOR'S CERTIFICATION: This submittal has been reviewed by the Contractor in compliance with Submittal Procedures of the CONTRACT DOCUMENTS' SPECIFICATIONS. Any deviations or substitutions to the CONTRACT DOCUMENTS have been identified above and submitted in compliance with the CONTRACT DOCUMENTS.

If this is a re-submittal, identify on a sheet(s) attached to this form all responses to comments on the previous submittal and all changes other than those specifically requested by the A/E on the previous submittal.

Signed _____ Date:

A/E'S REVIEW RESPONSE

(*Refer to Submittal Specification for explanation of categories.*)

Date Received:	No. Copies Received:
☐ **NO EXCEPTION TAKEN**	
☐ **MAKE CORRECTIONS NOTED**	
☐ **REVISE & RESUBMIT**	
☐ **REJECTED/RESUBMIT**	
☐ **RECEIPT ACKNOWLEDGED**	
By:	Date:
Date Returned:	No. Copies Returned:
A/E'S COMMENTS, IF ANY:	
A/E'S ATTACHMENTS, IF ANY:	

Note: DO NOT combine items from different specification sections into one submittal unless called for in the Section. If provisions in the "General Conditions" conflict with this form, the provisions as stated in the "General Conditions" shall prevail.

MOLZENCORBIN
ENGINEERS | ARCHITECTS | PLANNERS
2701 Miles Road SE, Albuquerque, NM 87106

SECTION 01 42 13

ABBREVIATIONS AND ACRONYMS

PART 1 GENERAL

1.01 SPECIAL

A. A/E – Architect/Engineer.

B. EPA – United States Environmental Protection Agency.

C. NMED – New Mexico Environment Department.

D. OSE – Office of State Engineer.

E. OSHA – Occupational Safety and Health Administration.

1.02 OTHER

A. As indicated on the Drawings, as apparent from the Drawings, or in accordance with standard practice.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Abbreviations and acronyms used in Contract Documents to identify reference standards.

1.02 QUALITY ASSURANCE

A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes establish stricter standards.

B. Publication Date: The publication in effect on the date of bid, except when a specific publication date is specified.

1.03 ABBREVIATIONS, NAMES, AND ADDRESSES OF ORGANIZATIONS

A. Obtain copies of referenced standards direct from publication source, when needed for proper performance of Work, or when required for submittal by Contract Documents.

AA	Aluminum Association 818 Connecticut Avenue, NW Washington, D.C. 20006
AASHTO	American Association of State Highway and Transportation Officials 444 North Capital Street, NW Washington, DC 20001
ABMA	American Bearing Manufacturers Association (formerly Anti-friction Bearing Manufacturers Association) 2025 M. Street, NW, Suite 800 Washington, DC 20036-3309
ACI	American Concrete Institute Box 19150 Reford Station Detroit, MI 48219

ADAAG	Americans with Disabilities Accessibility Act Guidelines www.access-board.gov/adaag
ADC	Air Diffusion Council 230 North Michigan Avenue Chicago, IL 60601
AGMA	American Gear Manufacturers Association 1001 N. Fairfax Street, Suite 500 Alexandria, VA 22314-1587
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AISC	American Institute of Steel Construction 1221 Avenue of the Americas New York, NY 10020
AISI	American Iron and Steel Institute 1000 16 Street, NW Washington, DC 20036
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
APWA	American Public Works Association 1313 E. 60th Street Chicago, IL 60637
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 345 East 47 Street New York, NY 10017
ASME	American Society of Mechanical Engineers 345 East 47 Street New York, NY 10017
ASTM	American Society for Testing and Materials International 1916 Race Street Philadelphia, PA 19103

AWI	Architectural Woodwork Institute 1411 S. Rimpau Avenue, Suite 213 Corona, CA 92879-7500
AWWA	American Water Works Association 6666 W. Quincy Avenue Denver, CO 80235
AWS	American Welding Society 2501 NW 7 Street Miami, FL 33125
CBM	Certified Ballast Manufacturers 1422 Euclid Avenue Cleveland, OH 44115
CPSC	Consumer Products Safety Commission www.cpsc.gov
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street, Suite 2110 Chicago, IL 60601
CSA	Canadian Standards Association 178 Rexdale Boulevard Rexdale, Ontario, Canada M9W 1R3
DHI	Door and Hardware Institute 7711 Old Springhouse Road McLean, VA 22102
EEI	Edison Electric Institute 1111 19 Street, NW Washington, DC 20036
ETL	Electrical Testing Laboratories 2319 Dorris Place Los Angeles, CA 90031
FM	Factory Mutual www.fmglobal.com

FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Bldg. 197 Washington, DC 20407 www.fss.gsa.gov/pub/fed-specs.cfm
GA	Gypsum Association 1603 Orrington Avenue Evanston, IL 60201
HI	Hydraulic Institute 6 Campus Drive, First Floor North Parsippany, NJ 07054-4405
IBC	International Building Code published by International Code Council 500 New Jersey Avenue, NW, 6th floor Washington, DC 20001
ICEA	Insulated Cable Engineers Association P.O. Box P South Yarmouth, MA 02664
IEEE	Institute of Electrical and Electronics Engineers 345 East 47 Street New York, NY 10017
ISA	Instrument Society of America 67 Alexander Drive P.O. Box 12277 Research Triangle Park, NC 27709
MIL	Military Specification Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
NACE	National Association of Corrosion Engineers P.O. Box 21830 Houston, TX 77218

NEC	National Electric Code Batterymarch Park P.O. Box 9101 Quincy, MA 02269
NEMA	National Electrical Manufacturers' Association 2101 L Street, NW Washington, DC 20037
NESC	National Electric Safety Code 345 East 47 Street New York, NY 10017
NFPA	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
NFPA	National Forest Products Association 1619 Massachusetts Avenue, NW Washington, DC 30036
NMBC	New Mexico Building Code Code Regulations Licensing Department Construction Industries Divisions 725 St. Michaels Drive Santa Fe, NM 87504
NRCA	National Roofing Contractors Association www.nrca.net
NSF	National Sanitation Foundation International P.O. Box 130140 789 N. Dixboro Road Ann Arbor, MI 48105
NWWDA	National Wood Window and Door Association P.O. Box 34518 Memphis, TN 38184
OSHA	Occupational Safety & Health Administration www.osha.gov
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 20076

PCI	Prestressed Concrete Institute 20 North Wacker Drive Chicago, IL 60606
SDI	Steel Door Institute 712 Lakewood Center North Cleveland, OH 44107
SIGMA	Sealed Insulating Glass Manufacturer's Association 111 East Wacker Drive Chicago, IL 60601
SJI	Steel Joist Institute 1703 Parham Road Suite 204 Richmond, VA 23229
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association, Inc. 8224 Old Court House Road Vienna, VA 22180
SSPC	The Society for Protective Coatings (formerly Steel Structure Painting Council) 40 24th Street, 6th Floor Pittsburgh, PA 15222-4656 (877) 281-7772
UBC	Uniform Building Code International Conference of Building Officials 5360 Workman Mill Road Whittier, CA 90601-2298
UL	Underwriters' Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062
UPC	Uniform Plumbing Code International Association of Plumbing/Mechanical Officials 20001 Walnut Drive, South Walnut, CA 91789-2825

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 23

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Employ and pay for the services of an independent testing laboratory to perform specified services and testing associated with soil gradation and density, concrete, and asphalt.

B. If the work includes bacteriological testing of water associated with disinfection, refer to Section 33 13 13 – Disinfection of Domestic Water Systems, for certification of the water test laboratory and payment procedures for bacteriological testing.

1.02 ADDITIONAL REQUIREMENTS

A. Conditions of the Contract: Testing required by laws, ordinances, rules, regulations, orders or approval of public authorities.

B. Each specification section listed: Laboratory tests required and standards for testing.

1.03 SUBMITTALS

A. Submit for Engineer's review the name of proposed Laboratory to perform required testing and their statement of qualifications.
   1. Name(s) of professional engineer(s) registered in the state in which the project is located who will be signing test results.
   2. Qualifications of technicians and their certifications, such as NICET (National Institute for Certification in Engineering Technologies), to perform testing required for this project as specified in ASTM E329.
   3. Evidence of current participation in the AASHTO Materials Reference Laboratory (AMRL) program, and accreditation of the laboratory and list of test methods currently accredited by the AASHTO Accreditation Program (AAP).

1.04 QUALIFICATION OF LABORATORY

A. Meet basic requirements of ASTM E329, "Standard Specification Agencies Engaged in Testing and/or Inspection of Materials Used in Construction".

B. Authorized to operate in the State in which the Project is located by the local governing authority for the AASHTO Accreditation Program.

C. Testing Equipment:
   1. Calibrated at reasonable intervals by devices of accuracy traceable to either:
      a. National Institute of Standards and Technology (NIST) (formerly National Bureau of Standards).
      b. Accepted values of natural physical constants.

D. Office Location: The location at which specified services and testing will be performed or from which Testing Laboratory staff will mobilize to perform field work shall be within 50 miles of the project site.

1.05 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.

D. Promptly submit written report of each test; one copy to Engineer, one copy to Structural Engineer, and copies as required to Contractor. Each report shall include:
   1. Date issued.
   2. Project title and number.
   3. Testing laboratory number, address, and telephone number.
   4. Name and signature of laboratory technician.
   5. Date and time of sampling or field testing.
   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 test.
   11. Results of tests and compliance with Contract Documents.
   12. Interpretation of test results when requested by Engineer.

E. Perform additional tests as required by Engineer or the Owner.

F. In all cases, the Engineer shall determine the number, type and location of tests.

G. Provide signature and seal of a Professional Engineer, licensed in the State where work is being performed, and who is employed by the Laboratory on all test results.

1.06 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. Perform any duties of the Contractor.

1.07 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to Work, and manufacturer's operations.

B. Secure and deliver to the laboratory adequate quantities of representational 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 tests.
   4. For storage and curing of test samples.

F. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience and retests required for previously failed tests.

G. Notify testing laboratory at least 48-hours in advance of all testing required by job progress or conditions, or the Engineer.

H. Provide on-site facilities as required for initial curing of concrete cylinders.

1.08 PAYMENT

A. An allowance is included in the Bid Proposal to cover field testing performed by an independent testing laboratory. In accordance with Section 01 21 00 - Allowances, the Owner will reimburse the Contractor for the actual cost of all such testing based on invoices received from the laboratory.

B. The invoiced cost of mileage for all vehicles used shall be no greater than the standard mileage rate for business miles in effect at the times of occurrence, as published by the Internal Revenue Service (IRS).

C. The testing allowance stated in the Bid Proposal is an estimated dollar amount. The final dollar amount reimbursed to the Contractor for testing may be less than, equal to, or more than the stated allowance.

D. Actual reasonable sample shipping costs will be paid to the Contractor in the same manner and under the testing allowance.

E. Costs for testing described in Paragraph 1.07.F are not eligible for reimbursement.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 WATER

A. Water required for construction may be drawn from Owner's water system. Coordinate with Owner's Water Department representative for water service and installation of Owner-provided water meter. The closest point within the Owner's (County) system is southeast of Santa Fe Community College by the Rancho Viejo development.

1.02 ELECTRICITY

A. Contractor's sole responsibility and expense.

1.03 OTHER

A. All other temporary utilities required to accomplish the Work to be the responsibility of and at the Contractor's sole expense.

1.04 RELATED REQUIREMENTS

A. Section 01 52 13 – Field Offices and Sheds.

1.05 SPECIAL PROJECT REQUIREMENTS SCHEDULE

A. Provide sanitary facilities for Contractor's personnel.

B. Water for Construction:
   1. Water for construction is available from the following locations:
      a. Water for construction may be drawn from the County's system as stated above, or purchased from the Eldorado Water and Sanitation District, the City of Santa Fe, or another private water supplier.
      b. Refer to Section 01 12 16 – Work Sequence.
   2. Water drawn by Contractor shall be used only for construction of this project. Contractor is not allowed to sell water to other users.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 52 13

FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Furnish, install, and maintain storage and work sheds needed for construction and temporary field offices during entire construction period.

B. At completion of Work, remove field offices, sheds, and contents.

1.02 OTHER REQUIREMENTS

A. Prior to installation of offices and sheds, consult with Engineer on location, access, and related facilities.

B. Furnish, install, and maintain temporary electrical, internet, and other services, as needed.

1.03 REQUIREMENTS FOR FACILITIES

A. Construction:
1. Structurally sound, weathertight, with floors raised above ground.
2. Temperature transmission resistance: Compatible with occupancy and storage requirements.
3. At Contractor's option, portable or mobile buildings may be used. Mobile homes, when used, shall be modified for office use.

B. Contractor's Office and Facilities:
1. Size: As required for general use.

C. Storage Sheds:
1. To requirements of various trades.
2. Dimensions: Adequate for storage and handling of products.
3. Ventilation: Comply with specified codes and requirements for products stored.
4. Heating: Adequate to maintain temperatures specified in respective sections for products stored.

D. Office for Engineer's Resident Project Representative:
1. Structure physically separate from Contractor's office.
2. 15' x 8' minimum floor dimensions.
3. Adequate lights, electricity, and thermostat-controlled heating and refrigerated air cooling.

4. Combination copy/file/printer machine with scan capability for 8-1/2” x 11” and 11” x 17” sheets. Contractor shall pay monthly service charge and shall furnish paper and toner cartridges sufficient to copy up to 500 sheets per month.
5. Internet connection capable of fast (minimum of 1.5 Mbps) download of information. The system shall be unlimited in connection use, uninterruptible and continuous until contract completion. The Contractor shall pay for all services associated with this connection/installation.
6. Desk (minimum 4 drawer), four (4) drawer legal size filing cabinet, swivel desk chair, 3’ x 5’ drafting table, adjustable drafting chair or adjustable stool, and visitor’s chair.
7. Office to be installed at site before any payment made to Contractor and maintained at site until Substantial Completion is reached on all portions of the Work.
8. Locking door with only Engineer to have key.
9. Identified with sign stating:
   a. Molzen Corbin Consulting Engineers:
   b. No hiring done here.
   c. No deliveries made here.
   d. No telephone available.
10. Security of office is Contractor’s responsibility.

1.04 USE OF EXISTING FACILITIES

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

1.05 MATERIALS, EQUIPMENT, FURNISHINGS

A. May be new or used, but must be serviceable, adequate for required purpose, and must not violate applicable codes or regulations.

1.06 PREPARATION

A. Fill and grade sites for temporary structures to provide surface drainage.

1.07 INSTALLATION

A. Construct temporary field offices and storage sheds on proper foundations; provide connections for utility services.
   1. Secure portable or mobile buildings when used.
   2. Provide steps and landings at entrance doors.

1.08 MAINTENANCE AND CLEANING

A. Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment, and services.

1.09 REMOVAL

A. Remove temporary field offices, contents, and services when no longer needed.

B. Remove storage sheds when no longer needed.

C. Remove foundations and debris; grade Site to required elevations and clean areas.

1.10 MEASUREMENT AND PAYMENT

A. Field offices and sheds are considered incidental to the Work to be completed. No separate payment shall be made for field offices and sheds.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 55 00

TRAFFIC REGULATION

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Provide, operate and maintain equipment, services and personnel, with traffic control and protective devices as required to expedite public vehicular traffic flow and access on haul routes, at site entrances, on-site access road, parking areas, and any areas affected by construction operations.

B. Remove temporary equipment and facilities when no longer required, restore grounds to original, or to specified conditions.

1.02 RELATED REQUIREMENTS

A. Section 01 14 16.01 – Coordination with Public and Utility Interruptions

B. Section 01 56 00 – Barriers

1.03 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples
   1. Qualifications of person who prepares the Traffic Control Plan (TCP).
   2. Submit Traffic Control Plan to Engineer.

1.04 TRAFFIC CONTROL SIGNALS AND SIGNS

A. Submit proposed Traffic Control Plan (TCP) prior to implementation:
   1. Full conformance with the Department of Transportation "Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)," latest edition.
   2. TCP shall be prepared by a person possessing one of the following current certifications:
      a. Traffic Control Supervisor (TCS) certified by the American Traffic Safety Services Association (ATSSA).
      b. Design and operation of Work Zone Traffic Control course credits offered by the National Highway Institute.
      c. Work Zone Temporary Traffic Control Technician certified by the International Municipal Signal Association (IMSA).
   3. The person who prepares the TCP shall visit the project site prior to preparing the TCP.

B. Provide traffic control and directional signs for all closures and detours, mounted on barricades or standard posts with warning flashing lights. Any deviation from "MUTCD" requires prior approval of Engineer.

1.05 CONSTRUCTION PARKING CONTROL

A. Control Contractor's and construction personnel's private vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles or Owner's operations.

1.06 SPECIAL REQUIREMENTS FOR THIS PROJECT

A. Provide traffic and detour controls and signs as required on Drawings and as necessary to meet the requirements of this Section, Section 01 14 16.01 – Coordination with Public and Utility Interruptions.

B. The Contractor shall have a responsible person on site during working hours and on call during non-working hours to inspect and maintain project traffic control.

C. All non-applicable signing shall be removed or covered completely with an opaque non-light transmitting material. All remaining, non-applicable traffic control devices are to be removed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 56 00

BARRIERS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Furnish, install, and maintain suitable barriers as required to prevent public entry, and to protect the public, Work, and existing facilities; remove when no longer needed or at completion of Work.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 BARRIERS

A. Materials to Contractor's option, as appropriate to serve required purpose.

PART 3 EXECUTION

3.01 GENERAL

A. Install facilities of a neat and reasonable uniform appearance, structurally adequate for required purposes.

B. Maintain barrier during entire construction period.

C. Relocate barriers as required by progress of construction.

D. Provide barriers to protect the public from excavations and hazardous conditions and operations.

E. If a trench or excavation, where accessible to the public, is left open at night or weekends, it must be barricaded with flashing lights.

3.02 FENCES

A. Fence Location:
   1. Locate fence to enclose substantially entire Project site or that portion the Contractor establishes as required to encompass entire Project construction operation.

2. Locate vehicular entrance gates in suitable relation to construction facilities; and to avoid interference with traffic on public thoroughfares.

B. Chainlink Fence:
1. Fence not generally required for sewer lines, waterlines, and street work.
2. Fence generally required for treatment plant, pump stations, and similar facilities.

3.03 REMOVAL

A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed.

B. Clean and repair damage caused by installation, fill and grade areas of the site to required elevations and slopes, and clean the area.

END OF SECTION

SECTION 01 57 00

TEMPORARY CONTROLS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Provide and maintain methods, equipment, and temporary construction, as necessary to provide controls over environmental conditions at the construction site and related areas under Contractor's control; remove physical evidence of temporary facilities at completion of Work.

1.02 NOISE CONTROL

A. Limit to practical extent.

B. Limit to normal working hours when practical.

1.03 DUST CONTROL

A. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and provide positive means to prevent airborne dust from dispersing into the atmosphere.

1.04 WATER CONTROL

A. Provide methods to control surface water to prevent damage to the Project, the site, or adjoining properties.
   1. Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas; and to direct drainage to proper runoff.

B. Provide, operate and maintain hydraulic equipment of adequate capacity to control surface water.

C. Dispose of drainage water and dewatering water in a manner to prevent flooding, erosion or other damage to any portion of the site or to adjoining areas. Any public agency or private landowner arrangements, permits, or other approvals required for the discharge of water are the sole responsibility of the Contractor.

1.05 PEST CONTROL

A. As found necessary during construction.

1.06 RODENT CONTROL

A. Provide rodent control as necessary to prevent infestation of construction or storage area.
   1. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.
   2. Should the use of rodenticides be considered necessary, submit an informational copy of the proposed program to Owner with a copy to Engineer. Clearly indicate:
      a. The area or areas to be treated.
      b. The rodenticides to be used, with a copy of the manufacturer's printed instructions.
      c. The pollution preventive measures to be employed.

B. The use of any rodenticide shall be in full accordance with the manufacturer's printed instructions and recommendations and applicable laws and regulations.

1.07 DEBRIS CONTROL

A. Maintain all areas under Contractor's control free of extraneous debris.

B. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, or along access roads and haul routes.
   1. Provide containers for deposit of debris as specified in Section 01 74 00 – Cleaning and Waste Management.
   2. Prohibit overloading of trucks to prevent spillages on access and haul routes.
      a. Provide periodic inspection of traffic areas to enforce requirements.

C. Schedule periodic collection and disposal of debris as specified in Section 01 74 00 – Cleaning and Waste Management.
   1. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent accumulation.

1.08 POLLUTION CONTROL

A. Provide methods, means and facilities required to prevent the discharge of hazardous substances from construction operations.

B. Perform emergency measures required to report, contain and transport harmful substance discharges or spills by complying with Federal and State regulations.

C. Take special measures to prevent harmful substances from entering public waters.
   1. Prevent disposal of wastes, effluents, chemicals or other such substances adjacent to streams, or in sanitary or storm sewers.

D. Provide systems for control of atmospheric pollutants.
   1. Prevent toxic concentrations of chemicals.
   2. Prevent harmful dispersal of pollutants into the atmosphere.

1.09 EROSION CONTROL

A. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
   1. Hold the areas of bare soil exposed at one time to a minimum.
   2. Provide temporary control measures such as berms, dikes, drains, straw bales, silt fences, and wattles.

B. Construct fills and waste areas by selective placement to eliminate surface silts or clays which will erode.

C. Periodically inspect earthwork to detect any evidence of the start of erosion, apply corrective measures as required to control erosion.

1.10 SECURITY CONTROL

A. Provide temporary padlocks during construction on gates, hatches, doors, panels, and boxes having hasps. Coordinate with Owner to install specified permanent padlocks at completion of project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 58 01

PROJECT BULLETIN BOARD

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Provide and Maintain Bulletin Board:
   1. Weathertight
   2. Approximately 3’ x 5’
   3. Location approved by Owner/Engineer
   4. Accessible to employees

B. Display:
   1. Equal employment opportunity poster
   2. Federal and State wage rate information
   3. Safety posters
   4. Official announcements and notices

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 58 13

PROJECT IDENTIFICATION SIGNS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Furnish, install, and maintain project identification sign(s).

B. Remove signs on completion of construction.

C. Allow no other signs to be displayed.

1.02 RELATED REQUIREMENTS

A. Funding agency supplemental conditions may contain additional requirements.

1.03 PROJECT IDENTIFICATION SIGN(S)

A. Painted sign(s) of size, design, lettering, as scheduled.

B. Locate as directed by Engineer.

1.04 QUALITY ASSURANCE

A. Sign Painter: Professional experience in type of work required.

B. Finishes, Painting: Adequate to resist weathering and fading for scheduled construction period.

1.05 PAYMENT

A. Incidental to contract, no separate payment.

PART 2 PRODUCTS

2.01 SIGN MATERIALS AND CONSTRUCTION

A. Unless Otherwise Scheduled:
1. Sign size: 4’ x 8’
2. Sign material: 0.75 inch thick exterior grade plywood.
3. Supports: Two, 4” x 4” x 8’ supports, sign bolted to supports.
4. Color: White background, black lettering.
5. Lettering: Minimum 2” height.

PART 3 EXECUTION

3.01 MAINTENANCE

A. Maintain signs and supports in a neat, clean condition; repair damages to structure, framing, or sign.

B. Relocate signs if required by progress of the work.

3.02 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of project.

3.03 SCHEDULE

A. Information on sign to be determined.

END OF SECTION

SECTION 01 66 01

PRODUCT DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. For the purposes of this Specification Section, the terms “material and equipment” and “Products” have the same meaning and are used interchangeably.

B. Material and equipment incorporated into the Work:
1. New and free of defect unless otherwise shown on the Drawings.
2. Conform to applicable specifications and standards.
3. Comply with size, make, type and quality specified, or as specifically approved in writing by the Engineer.
4. Manufactured and Fabricated Products:
   a. Design, fabricate and assemble in accordance with the best engineering and shop practices.
   b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
   c. Two or more items of the same kind shall be identical, by the same manufacturer.
   d. Products shall be suitable for service conditions.
   e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
5. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.02 REUSE OF EXISTING MATERIAL

A. Except as specifically indicated or specified, materials and equipment removed from the existing structure shall not be used in the completed Work.

B. For material and equipment specifically indicated or specified to be reused in the Work:
1. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
2. Arrange for transportation, storage, and handling of products which require off-site storage, restoration or renovation. Perform such work at no additional cost to Owner.

1.03 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, such instructions shall be included with:
   1. Shop drawing and/or product data submitted if an operation and maintenance manual is not required, or if specified in the Shop Drawing subsection of the equipment section.
   2. Operation and maintenance data if required.

B. Handle, install, connect, clean, condition, and adjust products in strict accordance with such instructions and in conformity with specified requirements.
   1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.
   2. Do not proceed with work without clear instructions.

C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of Products in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.
   1. Deliver Products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
   2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that Products are properly protected and undamaged.

B. Provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

1.05 STORAGE AND PROTECTION

A. Store Products in accordance with manufacturer's instructions, with seals and labels intact and legible.
   1. Store products subject to damage by the elements in weathertight enclosures.
   2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

B. Exterior Storage:
   1. Store fabricated Products above the ground, on blocking or skids, prevent soiling or staining. Cover Products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
   2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored Products to assure that Products are maintained under specified conditions, and free from damage or deterioration.

D. Protection After Installation:
   1. Provide substantial coverings as necessary to protect installed Products from damage from traffic and subsequent construction operations. Remove when no longer needed.

E. Repair Damage:
   1. Repair damaged materials and equipment to new condition or replace with new, to the satisfaction of the Engineer. Refer to Conditions of the Contract.

1.06 NAMEPLATE DATA

A. Provide original component manufacturer's permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliance, and similar essential data. Locate nameplates in an accessible location.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 71 23

FIELD ENGINEERING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Provide and Pay for Field Engineering Services Required for Project:
   1. Survey work required in execution of Project.
   2. Engineering work for civil, structural or other professional engineering services specified or required to execute Contractor's construction methods.

1.02 QUALIFICATIONS OF SURVEYOR OR ENGINEER

A. Survey work during construction may be completed by the Contractor. However, all locations/elevations must be verified at the completion of the contract by a qualified land surveyor registered in the state in which the construction is being done. Final survey data shall be documented on the Record Drawings.

B. Engineering work by qualified professional engineer registered in the state in which the construction is being done.

1.03 SURVEY REFERENCE POINTS

A. Original basic horizontal and vertical control points for the Project are those designated on Drawings.

B. Locate existing control points, re-establish original control points, protect control points prior to starting site work, and preserve all permanent reference points during construction.
   1. Make no changes or relocations without prior written notice to Engineer.
   2. Report to Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
   3. Require surveyor to replace Project control points which may be lost or destroyed.
   4. Establish replacements based on original survey control.

C. Reconfirm all existing and original vertical elevation control points prior to the use of such points for project surveying. Reference control point for such reconfirmation is shown on Drawings.

D. Refer any apparent discrepancies to Engineer for resolution. Surveyor to assist Engineer with field work required for resolution of such apparent discrepancies.

1.04 PROJECT SURVEY REQUIREMENTS

A. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:
   1. Site improvements:
   2. Stakes for grading, fill and topsoil placement.
   3. Utility slopes and invert elevations.
   4. Batter boards for structures.
   5. Building foundation, column locations, and floor levels.
   6. Controlling lines and levels required for mechanical and electrical trades.

B. From time to time, verify layouts by same methods as required for control of the Work and when requested by the Engineer.

C. The Contractor shall take reasonable efforts to protect all existing property corners, permanent bench marks, right-of-way markers, government established monuments, and similar reference points. If any must be disturbed, the monuments must be referenced before removal and replaced as soon as work in the area is completed. Referencing and replacing shall be done by a licensed surveyor, and in the case of U.S.G.S. monuments and NMDOT right-of-way markers, shall be a first order survey work.

1.05 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

B. On completion of improvements, prepare record drawings showing all dimensions, locations, and elevations of construction.

1.06 SUBMITTALS

A. Submit name and address of Surveyor and Professional Engineer to Engineer.

B. Submit documents certifying current registration of Surveyor and Engineer.

C. On request of Engineer, submit documentation to verify accuracy of field engineering work.

D. Survey data and computations for all Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 71 23.17

NEW MEXICO DEPARTMENT OF TRANSPORTATION UTILITY PERMIT SURVEY REQUIREMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Provide and pay for professional survey services required for the Project:
   1. Survey work required in execution of the Project to complete “as-built” drawings in accordance with the New Mexico Department of Transportation Department utility permit surveying requirements.
   2. All work within the right-of-way under the jurisdiction of the New Mexico Department of Transportation Department.

1.02 QUALIFICATIONS OF SURVEYOR

A. Qualified land surveyor registered in the State of New Mexico, acceptable to Contractor and Owner.

1.03 HIGHWAY UTILITY PERMIT FOR THIS PROJECT

A. Copy of executed Permit to install utility facilities within right-of-way is on file with the Engineer for viewing at the request of the Contractor.

B. Contractor must comply with all Permit conditions identified in the Permit at no additional cost to the Owner.

1.04 UTILITY SURVEY REQUIREMENTS

A. All utility survey work shall be certified by a New Mexico Registered Land Surveyor.

B. Contractor shall provide “as-built” horizontal and vertical utility location information in hard copy and electronic file in AUTOCAD DWG (3D) format (AUTOCAD Release 14 or newer).

C. The standard horizontal datum shall be the North American Datum 1983 (NAD83) and the standard projections shall be the New Mexico State Plane Coordinate System 1983 (NMSPCS83).

D. The standard vertical datum shall be the North American Vertical Datum 1988 (NAVD88).

E. Submit data in CD ROM.

F. Utility location information shall be tied to New Mexico Department of Transportation monuments and referenced to highway mile posts.

G. Provide description on the electronic file of survey control, horizontal datum, vertical datum used to prepare the "as-built" documents, including the following:
   1. New Mexico Department of Transportation District Utility Permit Number (provided by Engineer).
   2. Name, address, registration number, and telephone number of responsible land surveyor.
   3. Date survey completed.
   4. Equipment used to conduct the survey.
   5. Horizontal and vertical control marks used to tie the survey to the NMSPC83 and NAVD88.
   6. Ground to Grid combined scale factor used.
   7. Utility Line Work: Elevations shall be provided every 500 feet and at all survey break points, including all high and low points.
   8. Structures: Elevations at all changes in elevations, i.e, top of structure surfaces, pipe inverts, bottom slab, etc.

1.05 RECORDS

A. On completion of improvements, prepare record (as-built) drawings showing all dimensions, locations, and elevations of construction as permitted under Part 1.04 of this Section.

1.06 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples.
   1. Number of Sets: Four.
   2. Printed Copy Drawing Size: 11" x 17".
   3. Electronic File: AUTOCAD .dwg format as specified herein.
   4. Submit before certifying Project is substantially complete. Project will not be considered substantially complete without complete submittal of utility permit survey data.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.01 PAYMENT

A. Surveying services are incidental Work to the Contract Documents' bid items. No separate payment allowed.

END OF SECTION

SECTION 01 74 00

CLEANING AND WASTE MANAGEMENT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Execute cleaning, during progress of the Work, and at completion of the Work, as required by General Conditions.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract

B. Each Specification Section: Cleaning for specific products or work.

1.03 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS

2.01 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

A. Execute periodic cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.

B. Provide on-site containers for the collection of waste materials, debris and rubbish.

C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.02 DUST CONTROL

A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

3.03 FINAL CLEANING

A. Type 1 – For Buildings:
   1. Employ skilled workmen for final cleaning.
   2. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.
   3. Wash and shine glazing and mirrors.
   4. Polish glossy surfaces to a clear shine.
   5. Ventilating Systems:
      a. Clean permanent filters and replace disposable filters if units were operated during construction.
      b. Clean ducts, blowers and coils if units were operated without filters during construction.
   6. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
   7. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that the entire Work is clean.

B. Type 2 – For Grounds and Exposed Concrete Work:
   1. Broom clean exterior paved surfaces; rake clean other ground surfaces.
   2. Broom clean all concrete slabs.
   3. Remove grease, mastic, adhesives, dust, dirt, stains, labels and other foreign materials from all piping systems surfaces and equipment.
   4. Prior to final completion or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas to verify that the entire Work is clean.

3.04 SCHEDULE

A. Type 2 Cleaning.

END OF SECTION

SECTION 01 74 17

STORM DRAINAGE DISCHARGE COMPLIANCE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Prepare a Storm Water Pollution Prevention Plan (SWPPP) to control storm water discharges from construction activities during the Project that disturb one or more acres, and comply with all other requirements of the USEPA-NPDES Program.

B. Scope of Work:

1. Work includes compliance with the U.S. Environmental Protection Agency (EPA), National Pollution Discharge Elimination System (NPDES) Regulations for Storm Water Discharges from construction sites, per 40 CFR, Parts 122, 123, and 124. Additional information on the EPA Construction General Permit (CGP) and SWPPP for construction activities can be found at:
https://www.epa.gov/sites/production/files/2017-06/documents/2017_cgp_final_permit_508.pdf
https://www.epa.gov/npdes/2017-construction-general-permit-cgp
2. Develop and submit a site-specific SWPPP prior to commencement of construction, and implement and maintain Best Management Practices (BMPs) identified in this plan to control erosion, pollution, sediment, and runoff during the construction of the Project. Storm water pollution prevention practices shall meet the current standards of the industry and all of the requirements of the current CGP. Contractor is encouraged to use the SWPPP template and reporting forms provided at the referenced web site.
3. Contractor shall determine and identify in the SWPPP if the Project is in an Arid or Semi-Arid area as defined in Appendix A – Definitions and Acronyms, of the CGP.
4. If the disturbed area is less than five acres, the Project duration is short and avoids the wet season, and the erosivity index (R factor) for the site is low, Contractor may apply for a Low Erosivity Waiver (LEW) Certification. The LEW calculation procedures and Certification Form are found on the referenced EPA websites. Contractor may use the calculation tool on the following EPA website to determine whether or not the site is eligible for a LEW.
https://www.epa.gov/npdes/rainfall-erosivity-factor-calculator-small-construction-sites
If the site is eligible for a LEW and Contractor properly submits the LEW Certification Form, Contractor is exempt from the requirements to prepare a SWPPP. Although the Contractor is not required to prepare a formal SWPPP document, it shall still be responsible for general good housekeeping of the site such as track-out prevention, concrete washout, erosion control, litter control, and any other appropriate efforts.

5. Contractor shall conduct site inspections, monitoring, and testing as required in the CGP and complete reports within the time required.
6. Contractor shall maintain and update the SWPPP as necessary and required by the CGP.
7. Contractor shall have the SWPPP available for review at all times.
8. Contractor shall remove non-permanent BMPs at completion of the Project.
9. All work specified in this Specification Section shall be provided by Contractor under the bid item listed in the Bid Form or, if no bid item is listed, shall be provided as incidental work at no additional cost to Owner.

C. Compliance with Storm Drainage Discharge Requirements:
1. Contractor shall meet all requirements of the most current version of the NPDES General Permit for Discharge from Construction Activities (CGP).
2. Contractor shall file a Notice of Intent (NOI) at least 14 days prior to commencing earth-disturbing activities and is required to use EPA's electronic NOI system or "eNOIsystem" to prepare and submit the NOI. In addition to submitting the Contractor's NOI, the Contractor shall assist the Owner in a timely fashion with the preparation and submittal of the NOI that is required to be submitted by the Owner.
3. Contractor shall file a Notice of Termination (NOT) and is required to use EPA's electronic NOI system or "eNOIsystem" to prepare and submit the NOT. In addition to submitting the Contractor's NOT, the Contractor shall assist the Owner with the preparation and submittal of the NOT that is required to be submitted by the Owner.
4. Owner will assist Contractor with the necessary information for preparation and certification of its subsequent NOI and NOT.

D. Contractor shall also submit one (1) copy of the completed SWPPP to Owner at the time Contractor submits his NOI.

E. By completing the NOI, Contractor is certifying to Owner that a SWPPP has been completed in conformance with the CGP Permit and is in Contractor's possession.

F. Contractor is the designated "Operator" of the Permit and is solely responsible for execution of the Project construction in conformance with CGP Permit condition(s) and requirement(s), including work performed by any subcontractor(s). Contractor shall immediately correct conditions related to the Project that are in violation of Permit requirements. Failure by Contractor to correct such conditions in a timely manner may subject Contractor to fines and/or penalties.

G. Contractor shall indemnify, defend, and hold Owner and its Representative(s) harmless from any fines and/or penalties issued for violations of Permit conditions.

H. In the event Contractor fails to comply with NPDES Permit requirements, Owner retains the right to enter upon the Project site and perform corrective measures. Any costs associated with corrective measures shall be the responsibility of, and shall be paid by, Contractor. Owner shall be entitled to deduct such costs from remaining

Contract Amounts, and if insufficient Contract Amounts exist, Contractor shall reimburse Owner for any deficiency.

I. If payment for the SWPPP is listed as a bid item in the Bid Form, payment shall be made in increments equal to the percent complete on the overall Project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 75 01

FIELD SERVICE REPRESENTATIVE

PART 1 GENERAL

1.01 FIELD SERVICE REPRESENTATIVE

A. Shall be employed by the manufacturer and shall regularly engage in field checkout, calibration, testing, trouble-shooting, installation supervision, and start-up of equipment or systems.

B. Shall have qualifications and experience acceptable to the Owner and the Engineer. Submit name and qualifications of Field Service Representative with the shop drawing submittal of the applicable equipment item.

C. A manufacturer's sales representative will not be acceptable as a field service representative unless the Contractor applies for and receives in writing a waiver for such from the Owner.

D. Shall be thoroughly familiar with the specific equipment or system for this project on arrival at the jobsite. The Field Service Representative shall perform installation supervision, field check-out, calibration, testing, troubleshooting, adjustment or other services as specified in the pertinent section.

E. The Engineer reserves the right to require a substitute Field Service Representative, at no extra cost to the Owner, if the Field Service Representative supplied by the manufacturer is not able to properly perform the required tasks.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TEST EQUIPMENT

A. Coordinate requirements for test equipment with Field Service Representative and ensure that all necessary standard and special test, calibration, and diagnostic equipment is available for start-up testing.

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Comply with requirements stated in these Contract Documents and in Specifications for administrative procedures in closing out the Work.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract. Fiscal provisions, legal submittals and additional administrative requirements.

B. Section 01 29 00 – Payment Procedures.

C. Section 01 33 23 – Shop Drawings, Product Data, and Samples.

D. Section 01 78 23 – Operation and Maintenance Data.

1.03 SUSPENSION OF WORK

1.04 A. When Contractor considers the work complete with the exception of pressure testing, disinfection, and the lines being placed in service. Contractor shall submit to Engineer:

1. A written notice that the Work, or designated portion thereof, is substantially complete.
2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, Engineer will make an inspection to determine the status of completion. If acceptable to Engineer and Owner, Engineer will notify Contractor in writing that the Suspension of Work is to begin and will not end until the Engineer has notified the Contractor that County water is available along the Old Las Vegas Highway at the 4 connection points shown within the plans. The Suspension of Work is estimated to last no longer than 6 months. After the Suspension of Work has ended, the Contractor shall begin working towards completing the project within 1 month of notice by Engineer that water is available along the Old Las Vegas Highway at the Calle Gurule intersection. Contractor shall complete the project within 3 months of notice by Engineer that water is available.

C. Should Engineer determine that the Work is not ready for the Suspension of Work:

1. Engineer will promptly notify the Contractor in writing, giving the reasons therefor.

2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of Suspension of Work completion to the Engineer.
3. Engineer will re-inspect the Work.
4. Owner may charge Contractor for all of Engineer's re-inspection time and costs at Engineer's standard billing rates through a credit by Change Order.

1.05 SUBSTANTIAL COMPLETION

A. When Contractor considers the Work is substantially complete, Contractor shall submit to Engineer:
1. A written notice that the Work, or designated portion thereof, is substantially complete.
2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, Engineer will make an inspection to determine the status of completion. If acceptable to Engineer and Owner, Engineer will notify Contractor in writing. Work is substantially complete when:
1. All systems are complete and functional.
2. All final Operation and Maintenance Manuals have been accepted.
3. Any required shakedown testing periods have been completed.
4. Utilities, alarms, electrical, area lighting, monitoring, controls, drains, piping, paving, and related components are in place and completed.
5. Facilities can be put to intended use.
6. Owner is able to use for intended use at no additional cost to Owner.

C. Should Engineer determine that the Work is not substantially complete:
1. Engineer will promptly notify the Contractor in writing, giving the reasons therefor.
2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Engineer.
3. Engineer will reinspect the Work.
4. Owner may charge Contractor for all of Engineer's reinspection time and costs at Engineer's standard billing rates through a credit by Change Order.

D. Contractor's warranty start date for equipment systems will be the date of Substantial Completion accepted by the Engineer/Owner for that specified equipment system.

E. After the Engineer and Owner have accepted the Work, or designated portion thereof, Owner will assume responsibility for operation and maintenance of the facilities and equipment, or designated portion thereof.

1.06 FINAL INSPECTION

A. When Contractor considers the Work is complete, Contractor shall submit written certification that:
1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
5. Work is completed and ready for final inspection.

B. Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should Engineer consider that the Work is incomplete or defective:
1. Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Engineer that the Work is complete.
3. Engineer will reinspect the Work.

D. When the Engineer finds that the Work is acceptable under the Contract Documents, Engineer will request the Contractor to provide closeout submittals as listed in Paragrash 1.06.

1.07 REINSPECTION FEES

A. Should Engineer perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
1. Owner will compensate Engineer for such additional services.
2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.08 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

A. Evidence of compliance with requirements of governing authorities.

B. Warranties and Bonds: To requirements of these Contract Documents.

C. Evidence of Payment and Release of Liens: To requirements of these Contract Documents.

D. Consent of Surety: To requirements of General Conditions.

E. Project Record Documents: To requirements of Section 01 78 39.

F. Operating and Maintenance Data: To requirements of Section 01 78 23.

1.09 FINAL ADJUSTMENT 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. Allowances.
      c. Unit Prices.
      d. Deductions from uncorrected Work.
      e. Deductions for liquidated damages.
      f. Deductions for reinspection payments.
      g. Other adjustments.
   3. Total Contract Sum, as adjusted.
   4. Previous payments.
   5. Sum remaining due.

C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.10 FINAL APPLICATION FOR PAYMENT

A. After receiving written notification from the Engineer that Contractor has completed all requirements specified in Paragraphs 1.03, 1.04, 1.06, and 1.07, Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Contract Documents.

B. Contractor shall provide the consent of surety to final payment when submitting the application for final payment.

C. Contractor shall provide all other documents specified in these Contract Documents for the final application for payment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Format and Content of Manuals

B. Submittal of Manuals

C. Schedule of Submittals

1.02 RELATED WORK

A. Section 01 29 00 – Payment Procedures

B. Section 01 77 00 – Contract Closeout

1.03 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 and systems shall be prepared by the equipment manufacturer or system supplier.

1.04 FORMAT

A. Prepare data in the form of an instructional manual for use by Owner's personnel.
   1. Binders:
      a. Preliminary manuals: Heavy paper covers.
      b. Final manuals: Commercial quality substantial, permanent, 3-ring or 3-post binders with durable, cleanable plastic covers. Covers of adequate size to easily contain required information.

B. Cover and Spine: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
   1. Title of Project.
   2. Identity of separate structure as applicable.
   3. Identity of general subject matter covered in manual.

C. Assemble and bind material in the same order as specified in Paragraph 1.06 with the material grouped in the same manner as the applicable portions of the CONTRACT DOCUMENTS.

D. Text: Manufacturer's printed data, or typewritten data on 20 lb. minimum, white, paper. Size: 8-1/2" x 11".

E. Drawings:
1. Provide reinforced punched binder tab, bind in with text.
2. Reduced to 8-1/2" x 11" or 11" x 17" and folded to 8-1/2" x 11".
3. Where reduction is impractical, folded and placed in 8-1/2" x 11" envelopes bound in text.
4. Suitably identified on drawings and envelopes.

F. Provide binder tab for each separate product, or each piece of operating equipment.
1. Provide typed description of product, and major component parts of equipment.
2. Provide indexed tabs corresponding to items listed in the table of contents.

1.05 CONTENT OF MANUALS

A. Table of Contents:
1. Provide title of project.
2. Contractor, name of responsible principal, address and telephone number.
3. Schedule of products and systems, indexed to the content of the volume.
4. List, with each product, the name, address and telephone number of:
   a. Subcontractor or installer.
   b. Maintenance contractor, as appropriate.
   c. Local source of supply for parts and replacement.
   d. Manufacturer.
5. 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 or part installed.
   b. Clearly identify the data applicable to the installation.
   c. Delete references to inapplicable information.
3. Preventive maintenance information shall be given for each major component of every piece of equipment in the format attached to the end of this Section.

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:
1. Supplement product data for the particular installation.
2. Organize in a consistent format under separate headings for different procedures.
3. Provide a logical sequence of instructions for each procedure.

E. Warranties and Bonds:
1. Copy of each Warranty, Bond and Service Contract Issued.
2. Provide information sheet for Owner's personnel.
3. Proper procedures in the event of failure.
4. Instances which might affect the validity of warranties or bonds.

F. Provide an installation, 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.

G. Additional Requirements for Operation and Maintenance Data: The respective sections of specifications.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Each Item of Equipment and Each System. Include and identify:
1. Description of unit or system and component parts.
2. Function, normal operating characteristics, and limiting conditions.
3. Performance curves, with engineering data and tests.
4. Complete nomenclature and commercial number of all replaceable parts.

B. Installation Instructions, include:
1. Manufacturer's complete installation instructions and recommendations.

C. Operating Procedures, include:
1. Startup, break-in, and routine normal operating instructions and sequences.
2. Regulation, control, stopping, shutdown and emergency instructions.
3. Summer and winter operating instructions, as applicable.
4. Special operating instructions.

D. Maintenance Requirements, include:
1. Routine procedures and guide for trouble-shooting.
2. Disassembly, repair and reassembly instructions.
3. Alignment, adjusting, balancing and checking instructions.
4. Preventive maintenance information for each major component of every piece of equipment as required on the "Preventive Maintenance Information & Equipment Data Sheet" attached at the end of this section.

E. Servicing and Lubrication Schedule, provide:
   1. List of lubricants required.
   2. Lubrication information for each major component of every piece of equipment as required on the “Preventive Maintenance Information & Equipment Data Sheet” attached at the end of this section.

F. Provide manufacturer’s printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer’s parts list, illustrations, assembly drawings and diagrams required for maintenance.

I. Provide list of original manufacturer’s spare parts, manufacturer’s current prices, and recommended quantities to be maintained in storage.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide other data as required under pertinent sections of specifications.

1.07 MANUAL FOR ELECTRIC AND ELECTRONIC ITEMS OR SYSTEMS

A. Description of system and component parts, include and identify:
   1. Function, normal operating characteristics, and limiting conditions.
   2. Performance curves, engineering data and tests.
   3. Complete nomenclature and commercial number of replaceable parts.

B. Circuit Directories of Panelboards; provide:
   1. Electrical service characteristics
   2. Controls
   3. Communications

C. Provide as-installed color coded wiring diagrams.

D. Operating Procedures, include:
   1. Routine and normal operating instructions.
   2. Sequences required.
   3. Special operating instructions.

E. Maintenance Requirements, include:
   1. Routine procedures and guide to trouble-shooting.
   2. Adjustment, balancing and checking instructions.

F. Provide manufacturer’s printed operation and maintenance instructions.

G. Provide list of original manufacturer’s spare parts, manufacturer’s current prices, and recommended quantities to be maintained in storage.

H. Provide other data as required under pertinent sections of specifications.

1.08 SUBMITTAL OF MANUALS

A. Preliminary Submittal of Manuals.
   1. Quantity:
      a. Submit number of preliminary manuals required by Contractor plus number to be retained by Engineer.
      b. As scheduled.
   2. Submit prior to the date of shipment of equipment or system.
   3. Engineer will review for acceptance and return to Contractor with comments as appropriate.
   4. Resubmittal Process:
      a. If unacceptable, Contractor to resubmit same number of preliminary copies for Engineer's review.
      b. Manuals will not be reviewed in detail once determined by the Engineer that a manual is not acceptable.
      c. No partial payment will be made for equipment materials or related system materials delivered to the site until preliminary manuals for that equipment are submitted and are acceptable to the Engineer.

B. Final Submittal of Manuals
   1. Quantity:
      a. Submit number required by Contractor plus number to be retained by Engineer.
      b. As scheduled.
   2. Submit copies no less than 30 calendar days prior to putting equipment or system in service.
   3. Engineer will review and compare with accepted preliminary manual.
   4. If acceptable, manuals will be distributed as follows:
      a. Contractor: For project record documents.
      b. Engineer: For files.
      c. Owner: Held by Engineer for later transmittal to Owner.
   5. If not acceptable, all copies will be returned to Contractor for revision or retained by Engineer and the necessary revision data requested from Contractor, at Engineer's option.
   6. 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.
   7. Submit copies of any revisions found desirable during instruction of Owner's personnel, with instructions for insertion for revising copies of manual.

C. Funding agency funds may be withheld from Owner if Owner's acceptable operation and maintenance manual is not submitted as required by the agencies. If this occurs and such is partially attributable to a delay by the Contractor in submitting the required operation and maintenance materials:
   1. Owner may withhold payments from Contractor.

2. Contractor shall not terminate or suspend work.
3. No additional costs or Contract time shall be claimed by Contractor if Owner withholds payments.

D. If Contractor requires additional copies of the operation and maintenance manuals for the Contractor's, subcontractor's or suppliers' use, such may be submitted and will be returned upon review by the Engineer.

1.09 REIMBURSEMENT FOR ENGINEER'S REVIEW COSTS

A. For all manual reviews beyond one review of the preliminary manual and one review of final manual:
1. Owner may charge Contractor for all of Engineer's review time and costs at Engineer's standard billing rates through a credit by Change Order.
2. Engineer will perform these unscheduled reviews in the same manner as other unscheduled work.

1.10 SUBSTANTIAL COMPLETION

A. Project will not be considered substantially complete until final O&M Manuals and manufacturer's instruction of Owner's personnel have been accepted by Engineer.

1.11 SCHEDULE OF SUBMITTALS

A. Prepare O&M Manuals for pieces of equipment where specified in the individual specification sections.

B. Quantities to be Processed by Engineer:
1. Preliminary Manuals: Submit Preliminary Manuals in **one** of the following formats:
   a. Electronic Format:
      1) Electronic file in searchable .pdf format, delivered via email or on one (1) CD.
      2) One (1) printed copy properly formatted in binder with labels and dividers as specified. Engineer will retain copy.
      3) Engineer's submittal review including submittal file will be returned to Contractor in electronic format.
   b. Or Printed Format:
      1) Two (2) printed copies properly formatted in binder with labels and dividers as specified.
      2) Engineer will return one (1) copy to Contractor.
      3) Any additional copies received will be discarded by Engineer.
2. Final Manuals: Submit Final Manuals in **each** of the following formats:
   a. Electronic Format:
      1) Three (3) copies of electronic files in searchable .pdf format, delivered on three (3) CDs.

b. And Printed Format:
   1) Three (3) printed copies.
   2) Engineer will retain three (3) copies.

C. The “Preventive Maintenance Information & Equipment Data Sheet” at end of this Section shall be completed and submitted with the preliminary and final operation and maintenance manuals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PREVENTIVE MAINTENANCE INFORMATION
AND
EQUIPMENT DATA SHEET

1. Equipment Name: _____

2. Equipment Number: _____

3. Equipment Manufacturer: _____

   Address: _____

   Phone: ( ) _____

4. Equipment Supplier: _____

   Address: _____

   Phone: ( ) _____

5. Nameplate Data:
   Drive Unit: _____ hp, _____ rpm, _____ volts, _____ O _____ FLA
   Motor class (dripproof, TEFC, etc.) _____
   Manufacturer _____
   Model No. _____ Serial No. _____
   Other _____

   Driven Unit: Flow with units _____
   Discharge Pressure with units _____
   Equipment Type _____
   Model No. _____ Serial No. _____
   Other _____

6. Method of Power Transmission (direct coupled, V-belt, etc.) _____
   _____

7. Maintenance Requirements (list on next sheet)

   Maintenance Operation: List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable.

   Frequency: List required frequency of each maintenance operation.

   Lubricant (if applicable): Refer by symbol to recommended lubricant from list in Item

8. Comments: Give other applicable comments concerning maintenance operation.

Maintenance Operation (including any special tools required)	Frequency	Lubricant	Comments
A.			
B.			
C.			

Use additional sheets if necessary.

9. Lubricant List (provide Mobil number in addition to any other recommended manufacturers):

Reference Symbol	Mobil	Chevron	Shell	Arco	Or Equal
List symbols used in Item 7, above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

10. This data sheet prepared by: _____

Firm: _____

Date: _____

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Maintain one printed record copy of the following record documents at the site for the Owner:
   1. Drawings.
   2. Engineer's response to Requests for Information (RFIs).
   3. Engineer Field Orders or written instructions.
   4. Accepted Shop Drawings, Product Data and Samples.
   5. Field Test records.
   6. Receipts for delivery of items to Owner.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in Contractor's field office apart from documents used for construction.
   1. Provide files and racks for storage of documents.
   2. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with specification format.

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

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

1.03 MARKING DEVICES

A. Provide felt tip marking pens for recording information in the color code designated by Engineer.

1.04 RECORDING

A. Label each document "PROJECT RECORD" in neat, large printed letters.

B. Record information concurrently with construction progress.
   1. Do not conceal any work until required information is recorded.

C. Drawings: Legibly mark to record actual construction:
   1. Changes made by addenda.

2. Depths of various elements of foundation in relation to finish first floor datum.
3. Horizontal and vertical locations of underground utilities and appurtenances, including bends in pipes; and internal utilities and appurtenances concealed in the construction. Measure and show locations on the Record Drawings by either:
   a. Referenced to permanent surface features or referenced to visible and accessible features of the structure.
   b. Or tabulate and plot coordinates on the Record Drawings measured using survey grade GPS or GNSS to an accuracy of 0.1 meter (4 inches) using a baseline tied into the project coordinate system control points.
4. Field changes of dimension and detail.
5. Changes made by Field Order or by Change Order.
6. Details not on original Contract Drawings.
7. For sewer lines: Invert elevations at manholes, line and manhole alignment, locations, and location of each service line referenced by distance from downstream manhole and distance from sewer centerline to end of service line.

1.05 SUBMITTALS

A. At Contract close-out, deliver Record Documents to Engineer for the Owner.

B. Submit to-scale dimensioned electronic drawing files of major equipment items installed that were not the design basis manufacturer. Drawings shall show general arrangement plan and sections. Drawing files shall be in AutoCAD .dwg format.

C. Accompany submittals 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.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 PAYMENT

4.01 RECORD DRAWINGS

A. Project record documents are incidental Work to the Contract Documents' Bid Items for which no separate payment will be made.

B. No payment will be made to the Contractor for any portion of the Work for which the project record documents are not complete.

END OF SECTION

SECTION 03 30 01

CONCRETE WORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Cast-In-Place Concrete

B. Reinforcing Steel

C. Forms

D. Admixtures

E. Embedments

1.02 ADDITIONAL REQUIREMENTS SPECIFIED ELSEWHERE

A. Section 01 45 23 – Testing Laboratory Services.

1.03 SUBMITTALS

A. Shop Drawings and Product Data:

B. Concrete mix design.

C. Proposed admixtures, per ACI 318.

D. Reinforcing bar lists, fabrication, and placement drawings for structures.

E. Concrete accessories.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Storage:
1. Cement and fly ash:
   a. Store in moistureproof enclosures.
   b. Do not use if caked or lumpy.
2. Aggregate:
   a. Store to prevent segregation and inclusion of foreign materials.
3. Reinforcing Steel: Store on supports which will keep it from contact with the ground.
4. Rubber and Plastic Materials:
   a. Store in a cool place.
   b. Do not expose to direct sunlight.

PART 2 PRODUCTS

2.01 MATERIALS

A. Forms:
1. The form work shall be designed in accordance with ACI 347.
2. Chamfer Strips: Clear white pine, surface against concrete planed.
3. Form Coating: Industrial lubricants “Nox-crete Form Coating”, “L&M Debond”, Protex “Pro-Cote”, Richmond “Rich Cote”, or Engineer reviewed equivalent.
4. Form ties: Removable end, permanently embedded body type not requiring auxiliary spreaders, with cones on outer ends, embedded portion 1” minimum back from concrete face. If not provided with threaded ends, constructed for breaking off ends without damage to concrete.
5. Earth cuts shall not be used as forms for vertical surfaces, unless indicated on project drawings.

B. Reinforcing Steel:
1. Bars: ASTM A615, Grade 60.
2. Welded wire fabric: ASTM A185 or A497.
3. Bar supports: PS7; CRSI Class B, fabricated from galvanized wire.

C. Concrete:
1. Cement: ASTM C150, Type I or II. Use Type III only with prior written approval of Engineer.
2. Fly Ash: ASTM C618, Class F, except loss on ignition not more than 5%
3. Fine Aggregate: Clean, natural sand, ASTM C33.
4. Coarse Aggregate: Crushed rock, natural gravel or other inert granular material, ASTM C33 except clay and shale particles no more than 1%.
5. Water: Clean, fresh and potable.
6. Admixtures:
   a. Retarder: ASTM C494, Type D; Grace “Duratard-HC”, Master Builders “Pozzolith 300-R”, Protex “Protard”, Sika Chemical “Plastiment”, or Engineer reviewed equivalent.
   b. Plasticizer: ASTM C494, Type A; Grace “WRD A-HC”, Master Builders “Rheobuild 1000”, Sika Chemical “Plastocrete”, or Engineer reviewed equivalent.
   c. Air Entraining Agent: ASTM C260; Grace “Darex AEA”, Master Builders “AE 90”, Protex “AES”, Sika Chemical “AEK”, or Engineer reviewed equivalent.
   d. Water reducing agent ASTM C494, Type A; Master Builders “Pozzolith 322-N”, or Engineer reviewed equivalent.

D. Accessories:
1. Polyethylene film: PS17, 6 mil.
2. Membrane curing compound and floor sealer: FS TT-C-600, Type 1; chlorinated rubber, minimum 18% solids; Grace "Dekote", Process Solvent "Concrete Treatment ALX-9", Protex "Triple Seal Series CRD-18", TK Product "Tri-Kote TK-18", or Engineer reviewed equivalent.
3. Expansion and contraction joint: Elastic
   a. Rubber: Dumbell, 9" wide, 3/8" thick with 3/4" bead on each end, WR Grace, U.S. Rubber, William or Engineer reviewed equivalent.
   b. PVC: Ribbed or serrated, 9" wide, 3/8" thick with "U" or "O" bulb closed center section, WR Grace, WR Meadows, Vinylex or Engineer reviewed equivalent.
4. Exterior expansion joint material: Asphalt impregnated fiberboard: ASTM D994.
5. Bond break joint material: 30 lb. asphalt saturated felt, ASTM D226.
6. Interior slab construction joint material: Preformed 20 gage steel or as indicated on Drawings.

2.02 CONCRETE MIX

A. Comply with ASTM C94.

B. Water to Cementitious Material Ratio: Maximum 0.50.

C. Slump: Maximum 4.0", unless otherwise scheduled.

D. Compressive Strength: 28 days - 3000 psi, unless otherwise scheduled or shown on the Drawings.

E. Volumetric Air Content: 4.5% to 7.5%, air may be omitted for interior slabs to be trowel finished.

F. Admixtures:
1. Content, batching method, and time of introduction in accordance with the manufacturer's recommendations for compliance with this Specification.
2. Include a water reducing admixture.
3. Calcium chloride shall not be used.

G. Coarse Aggregate:
1. Maximum nominal dimension:
2. 3/4" for 8" concrete members.

H. Consistency:
1. Suitable for the placement conditions.
2. Slump uniform.
3. Aggregate floating uniformly throughout the concrete mass.
4. Flow sluggishly when vibrated or spaded.

5. Adjust mix in field, with Engineer's approval, as required to meet specifications.

2.03 FABRICATION

A. Reinforcing Steel:
1. Fabricate in accordance with ACI 315 and 318 except as specified or indicated on Drawings.
2. Accurately fabricated.
3. Free from loose rust, scale, and contaminants which will reduce bond.

PART 3 EXECUTION

3.01 INSTALLATION

A. Forms:
1. In accordance with ACI 347.
2. Mortartight.
3. Exposed concrete surfaces free from irregularities.
4. True to line, grades, and dimensions shown on the Drawings.
5. Rigid and properly braced.
6. Ties arranged so that metal will not show or discolor concrete surface.
7. Bevel or chamfer exterior corners.
8. Coat forms with acceptable release material.

B. Reinforcing Steel:
1. Remove loose rust, scale, grease or any coating which may impair bond to concrete. Remove all rust that can be wiped off with a cloth.
2. Provide supports to provide minimum cover and spacing.
3. Provide splice lengths as required by ACI 318.

C. Embedments:
1. Accurately placed for the purpose intended.
2. Remove loose rust, scale, and other foreign matter before placing concrete. Remove all rust that can be wiped off with a cloth.

D. Concrete:
1. Place before initial set has occurred, but in no event after the concrete has contained its water content for more than 30 minutes.
2. Place concrete on compacted moist surfaces, free from standing or running water.
3. Concrete to be conveyed and placed in an approved manner to prevent segregation of the coarse aggregate.

4. Cold weather concreting:
   a. Comply with ACI 306.
5. Hot weather concreting:
   a. Comply with ACI 305.

E. Expansion and Contraction Joints:
   1. Provide as indicated on the Drawings.

F. Finishing:
   1. Not required on buried surfaces.
   2. No special concrete or cement mortar topping allowed for slab finish.
   3. Slabs brought to true and even finish by screeding, floating, and finishing to product a smooth impervious surface, free from blemishes.
   4. Unless otherwise specified or shown on the Drawings, a steel trowel finish shall be applied.
   5. Excess water shall not be present when the finish is made.

G. Curing:
   1. Cure concrete by approved method which will keep surfaces adequately wet or protected from moisture loss for the curing period.

H. Repairing Defective Concrete:
   1. Repair defects in formed concrete surfaces within 24 hours.
   2. Replace defective concrete within 48 hours.
   3. Cut out and remove to sound concrete honeycombed or otherwise defective concrete.
   4. Cut edges square to avoid feathering.
   5. Comply with Chapter 9, ACI 301.
   6. Perform repair work so as not to interfere with thorough curing of adjacent concrete.
   7. Adequately cure repair work.

3.02 FIELD QUALITY CONTROL

A. Perform Field Control Test:
   1. Tests by qualified personnel.
   2. Make tests in presence of Engineer’s representative.
   3. Provide all equipment, supplies, and the services of one or more employees, as required.
   4. The test frequencies specified are minimum; perform additional tests as required by the job conditions.

B. Slump: Perform a test for each load in accordance with ASTM C143.

C. Air Content: Test one sample from one of each three batches made and from each batch which test cylinders are made in accordance with ASTM C231.

D. Compression Tests:

1. Make one set of four cylinders from every load or batch or portion thereof.
2. Make, cure, store, and deliver cylinders in accordance with ASTM C31.
3. Mark or tag each set of test cylinders with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the delivery truck or batch number, the air content, and the slump.
4. Testing Laboratory Will:
   a. Test one cylinder in each set at 7 days.
   b. Test two cylinders from each set at 28 days.
   c. If compressive strength does not reach specified compressive strength at 28 days, test remaining cylinder at 56 days.
   d. Do not test or discard remaining cylinder until so instructed by the Engineer.
   e. Engineer will evaluate in accordance with ACI 214 and 318.
   f. Test in accordance with ASTM C39.
5. 4” dia. x 8” cylinders may only be used under the following conditions:
   a. Coarse aggregate size for all mixes used on the project do not exceed 1” maximum size, and
   b. Test cylinders for all mixes used on the project shall be the same size.

E. Concrete used solely for blocking of water line valves or fittings will not require testing. It shall, however, be subject to acceptance by the Engineer as to its suitability.

END OF SECTION

SECTION 31 10 00

REMOVALS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This work includes the removal and disposal of all obstructions, materials, and resultant debris required for the completion of construction.

1.02 REFERENCES

A. Manual on Uniform Traffic Control Devices (MUTCD).

1.03 QUALITY ASSURANCE

A. Conduct removal operations to prevent damage to adjacent property, buildings, and other facilities.

B. Any damage to adjacent property or facilities shall be promptly repaired at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 EXPLOSIVES

A. The use of explosives for removals is prohibited.

PART 3 EXECUTION

3.01 REMOVAL

A. Remove all items shown on Drawings to be removed.

B. Contractor shall not remove any other items without approval from Engineer.

C. Excavation created during removal operations shall be barricaded in accordance with MUTCD.

D. Contractor shall perform miscellaneous excavating, backfilling, and reshaping of slopes as required.

3.02 DISPOSAL

A. Contractor shall haul and dispose of all debris, rubbish, broken concrete, broken asphaltic concrete, rocks, and other material removed.

B. Disposal: In accordance with applicable State and Federal Regulations.

C. Burning of debris and rubbish will not be permitted on the project site.

END OF SECTION

SECTION 31 22 00

GRADING

PART 1 GENERAL

1.01 WORK INCLUDED

A. This work shall consist of shaping road beds and side ditches to subgrade preparation to the depths indicated on the Drawings.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials International:
1. ASTM D1556 – Density of Soil in Place by the Sand-Cone Method.
2. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
3. ASTM D2167 – Density of Soil in Place by the Rubber-Balloon Method.
4. ASTM D2216 – Laboratory Determination of Moisture Content of Soil.
5. ASTM D6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.03 QUALITY ASSURANCE

A. Testing Laboratory:
1. Contractor will provide material testing for quality control during earthwork operations.

1.04 JOB CONDITIONS

A. Do not construct embankments when atmospheric temperature is below 35°F.

PART 2 PRODUCTS

2.01 BORROW

A. Borrow shall consist of materials obtained from approved borrow areas designated by the Engineer for the construction of embankments.

B. Provide free of vegetation.

2.02 WASTE

A. Disposal of excess excavation shall be the responsibility of the Contractor. Excess material to be placed in location reviewed by Engineer.

2.03 EXCAVATION

A. Includes excavation, removal, backfill, and satisfactory disposal of all materials encountered in the work.

2.04 EMBANKMENT

A. Embankment construction shall consist of the formation of embankments with suitable material from on-site excavation.

PART 3 EXECUTION

3.01 GENERAL

A. Excavation and embankments for the roads shall be finished to the contours, shapes, dimensions, and elevations shown on the Drawings.

B. No materials shall be wasted without permission from the Engineer.

C. Perform clearing operations prior to beginning excavation, grading, and embankment operations.

3.02 SUBGRADE PREPARATION

A. See Section 31 23 13 – Subgrade Preparation.

3.03 GRADING

A. Provide uniform slopes and rounded changes in slope, free of low spots.

B. The degree of grade control shall not deviate from true grade and profile more than one-half inch as measured by a ten foot straightedge.

C. Drainage:
1. Provide and maintain positive surface water drainage around and away from open excavations.
2. Keep opened excavations dry.
3. Remove free water in excavations promptly.

3.04 EMBANKMENT

A. Embankments shall meet the compaction requirements specified in Subsection 3.05.

B. No frozen material, brush, sod, or unsuitable material shall be placed in the embankments.

C. In the distribution of embankment material, avoid lenses differing substantially from the surrounding material.

D. Deliver materials to the embankment in such a manner as to result in a well and uniformly compacted embankment.

3.05 EMBANKMENT AND BACKFILL COMPACTION

A. General:
1. Compact in eight inch loose horizontal layers.
2. Use moistened material when necessary.
3. Layers shall be uniformly compacted before a succeeding layer is placed.
4. Add water in sufficient quantity to obtain the specified compaction.
5. Do not allow free water to stand on an embankment surface.
6. Compaction shall be accomplished by approved methods and equipment.

B. Degree of Compaction:
1. Optimum density will be determined in accordance with ASTM D1557.
2. Perform compaction as follows:

Description	Percent of Maximum Dry Density to Be Not Less Than	Variation of Optimum Moisture
Embankment and backfill under roads, driveways or where otherwise scheduled	98%	+2
General area grading not included in the above	90%	+2

3.06 FIELD QUALITY CONTROL

A. Field control of density of in-place material will be determined in accordance with any of the following methods:
1. Nuclear Method, ASTM D6938
2. Rubber-Balloon Method, ASTM D2167
3. Sand-Cone Method, ASTM D1556

B. Field control of moisture content will be determined in accordance with either of the following methods:
1. Nuclear Method, ASTM D6938
2. Laboratory Determination, ASTM D2216

C. In-place density and moisture tests to be taken at intervals to be determined by the Engineer.

END OF SECTION

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structure and Site Excavation, Filling and Backfilling.

B. Compaction of Fill and Backfill.

C. Finish Grading.

1.02 SUBMITTALS

A. Laboratory Test Results for Select Fill, Ordinary Fill, and Pea Gravel:
   1. Moisture-density relationships (ASTM D1557).
   2. Gradation (ASTM C136, ASTM 422).
   3. Liquid limit, plastic limit, plasticity index (ASTM D4318).

1.03 PROTECTION

A. Protect trees, shrubs, lawns, and other features remaining as a portion of final site.

B. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from equipment and vehicular traffic.

C. Protect above and below grade utilities which are to remain.

D. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

E. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

F. Grade excavation top perimeter to prevent surface water run-off into excavation.

G. Protect structure walls, foundation, and similar features from structural stress during backfilling operations.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Material removed from excavations may be used for fill or backfill provided such material meets the requirements for fill and backfill specified in this Section. Some blending of materials may be necessary.

B. Exclude debris, large rocks, roots, organic material, expansive material and other deleterious materials.

C. Provide additional fill materials if necessary from off-site locations obtained by Contractor.

D. Do not use any materials containing any contaminants that may endanger public health. Do not use mine tailings.

E. Do not use any materials which have not been reviewed by the Engineer.

2.02 MATERIALS

A. Select Fill:
1. Clean, well graded, relatively cohesionless material free of organic or frozen matter.
2. Largest rock or clod dimension, 1”.
3. Plasticity index less than 8.
4. Maximum percent passing sieve (unless otherwise reviewed by Engineer):
   a. #10, 50%.
   b. #40, 30%.
   c. #200, 15%.

B. Ordinary Fill:
1. Clean, free of organic or frozen matter.
2. Largest rock or clod dimension, 3”.
3. Normally acceptable are Unified Soil Classification System Classified Materials: GW, GP, SW, SP, GM, SM, or GC.

C. Normal Backfill:
1. Excavated earth or sand thoroughly mixed to create uniform material.
2. Free of trash, debris, organic or frozen matter.
3. Largest rock or clod dimension, 2”.

D. Pea Gravel:
1. Mineral aggregate graded 0.25” to 0.38”.
2. Free of soil, clay and shale; free of organic, frozen debris, or foreign matter.

E. Sandfill:
1. Clean, well-graded material conforming to requirements of ASTM C33 for fine aggregate.

F. Moisture Barrier: 10 mil minimum polyethylene sheet.

PART 3 EXECUTION

3.01 GENERAL

A. The type of bearing material and the thickness and extent of structural fill (if required) are shown on the Drawings.

B. Interior non-structural slabs-on-grade are to be supported on granular fill not less than 6″ thick on structural fill not less than one foot thick. See Drawings for location where sand fill over polyethylene moisture barrier is required over granular fill.

C. Do not place or compact fill or backfill when the atmospheric temperatures are below 35°F. Protect completed fill or backfill areas from freezing. Recondition, reshape and recompact to the requirements of this section without additional cost to the Owner any areas which are damaged by freezing.

3.02 SHEETING, SHORING AND BRACING

A. Provide sheeting, shoring and bracing where required to hold walls of excavation and to protect workers and existing construction. Contractor shall be responsible for proper sizing and placement of Work.

B. Remove sheeting, shoring and bracing in manner to avoid damage to disturbance to Work. Leave sheeting and shoring in place where removal will endanger Work, adjacent construction or personnel. If sheeting or shoring is to be left in place, remove all traces of sheeting or shoring to a minimum depth of 2′-0″ below finish grade unless otherwise reviewed by the Engineer.

3.03 CLEARING AND GRUBBING

A. General: Clearing and grubbing are required for all areas shown on the plans to be excavated or where fill is to be constructed.

B. Clearing:
   1. Remove and dispose of trees and other vegetation, downed timber, snags, brush, and rubbish within areas to be cleared.

C. Grubbing:
   1. Remove stumps, matted roots, and roots larger than 2″ in diameter from within 6″ of the surface of areas on which fills are to be constructed, and within 18″ of finished subgrade of roadways.
   2. Areas disturbed by grubbing shall be filled as specified in this section for embankment.

3.04 PREPARATION

A. Excavation:
   1. Identify required lines, levels, contours, and datum.
   2. Identify all underground utilities and other facilities. Stake and flag locations.
   3. Identify and flag surface and aerial utilities.
   4. Maintain and protect existing utilities remaining which pass through work area.

B. Backfilling:
   1. When necessary, compact subgrade surfaces to density requirements for backfill material.
   2. Cut out soft areas of subgrade not readily capable of in situ compaction. Backfill with select fill and compact to density equal to requirements for subsequent backfill material.

3.05 EXCAVATION

A. Earth excavation shall consist of the excavation and removal of suitable soils for use as embankment as well as the satisfactory disposal of all vegetation, debris, and deleterious materials encountered within the area to be graded and/or in a barrow area.

B. Excavate soil to the extent required for structure foundations, construction operations, and other work. See Drawings for extent of excavation required beneath and adjacent to structures.

C. Barricade open excavations, keep spoil piles out of the way of the Owner's personnel and otherwise maintain safe access by the Owner's employees to the Owner's facilities during construction.

D. Do not undercut existing construction.

E. Do not permit surface water to enter open excavations. Provide barriers and positive drainage away from excavations as necessary. Remove promptly any water which may enter excavations from any source.

F. Machine slope banks.

G. After excavations are complete, notify Engineer for inspection of completed excavation. Do not begin placement of fill or begin other construction operations until excavation is reviewed by Engineer.

H. Fill unauthorized over excavated areas beneath structures with select fill and compact to density required for subsequent fill or backfill. If unauthorized excavation will result in structure being supported partly on select fill and partly on native material, extend excavation under entire structure and fill as specified below. Fill unauthorized overexcavated areas away from structures with fill of the type specified for subsequent fill compacted to the density specified.

I. Dispose of all excess excavated material and material unsuitable for backfilling generated by construction activities, off-site or as directed by Owner, unless otherwise stated in Contract Documents at no additional cost to Owner. Properly dispose of all materials in accordance with regulatory requirements.

3.06 SUBGRADE TREATMENT

A. At areas to receive structural fill, scarify the exposed native soils to a depth of not less than 12″. Add or remove water as necessary to bring the scarified material to optimum moisture content (within -0, +2 percentage points). Compact the scarified soil to not less than 98% of maximum dry density as determined by ASTM D1557.

3.07 FILLING AND BACKFILLING

A. Provide all fill material required to complete Work, either from on-site excavations or imported from off-site, at no additional cost to Owner.

B. Backfill areas to contours and elevations shown on Drawings using unfrozen materials.

C. Place fill under structures and elsewhere as shown on the Drawings. Fill all unauthorized or excess excavations to the elevations shown or specified.

D. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet or spongy subgrade surfaces.

E. Backfilling Around Structures:
1. Backfill after concrete has attained sufficient strength to withstand backfill pressures without detrimental effects.
2. Prevent displacement of construction during backfilling operations; backfill opposite sides simultaneously.

F. Placement:
1. Maintain surfaces free of water, debris, and other deleterious materials.
2. Place backfill and fill materials in successive horizontal layers not more than 8” in loose depth.
3. Place material at optimum moisture content (plus or minus two percentage points).
4. Material too dry or too wet shall be moistened or aerated to extent necessary to bring moisture content to within specified limits.

G. Compaction:
1. Compact fill and backfill using appropriate equipment as needed to achieve the densities specified below. Densities are expressed as percentages of the maximum dry density as determined by ASTM D1557.
2. Do not use heavy equipment in areas where existing construction may be damaged by the use of such equipment. Repair or replace without additional

cost to the Owner, any damage to existing construction caused by earthwork operations.

H. Slope grade away from building minimum 2″ in 10′ unless noted otherwise. Fill depressions and provide for positive drainage away from buildings and structures.

I. Make changes in grade gradual. Blend slopes into level areas. Finish grade to smooth uniformly sloping surfaces to elevations required for drainage.

J. Finish surface by grading to provide finished appearance.

K. Place polyethylene moisture barrier at locations shown on the Drawings. Overlap not less than 6″ at all joints; tape joints securely. Protect from damage during placement of sand fill. Repair any rips or tears. Place not less than 3″ of sand fill over polyethylene moisture barrier beneath slabs-on-grade where shown on Drawings.

3.08 TOLERANCES

A. Top Surface of Backfill: ± 2″.

B. Top Surface of Fill Beneath Structures: - 1′ + 0″.

3.09 FIELD QUALITY CONTROL

A. Section 01 45 23 – Testing Laboratory Services.

B. Test Schedule:
1. One field density test for each 250 square yards of prepared subgrade.
2. One field density test for each 100 cubic yards of fill or for each layer of fill, whichever results in the greater number of tests.
3. Or where directed by Engineer.

C. If tests indicate that work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

3.10 SCHEDULE OF FILL AND BACKFILL

Area	Type of Material	Degree of Compaction
General fills and embankments on the site	Ordinary fill	90%
Backfill behind walls and below or adjacent to additional construction	Select fill	95%

Area	Type of Material	Degree of Compaction
Backfill except as described above	Normal backfill	90%
Backfill and subgrade preparation below driveways and roadways	Normal backfill	98%

END OF SECTION

SECTION 31 23 13

SUBGRADE PREPARATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Preparing the completed subgrade prior to placement of subsequent pavement section components to the grade and dimensions indicated on the Drawings. This is inclusive of all processing, shaping, compacting, watering, protecting and any removal and replacement of unsuitable material to prepare the subgrade satisfactorily for completion of the pavement section.

1.02 REFERENCES

A. American Society for Testing and Materials International:
1. ASTM D1556 – Density of Soil in Place by the Sand-Cone Method
2. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))
3. ASTM D2167 – Density of Soil in Place by the Rubber-Balloon Method
4. ASTM D2216 – Laboratory Determination of Moisture Content of Soil
5. ASTM D6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.03 QUALITY ASSURANCE

A. Testing Laboratory:
1. Contractor shall provide material testing for quality control during subgrade preparation.

PART 2 PRODUCTS

2.01 SUITABLE MATERIALS

A. Suitable materials shall consist of materials obtained on site reviewed by the Engineer for the purpose of subgrade preparation.

B. Any underlying soft or otherwise unsuitable material shall be removed and replaced with suitable material.

C. Provide free of vegetation.

2.02 WASTE

A. Disposal of excavated materials shall be the responsibility of the Contractor. Excess material to be placed in location designated by Owner or Engineer.

PART 3 EXECUTION

3.01 PREPARATION

A. Excavations and embankments for the roads and site grading shall be finished to the shapes, dimensions, and elevations shown on the Drawings.

B. Perform clearing operations prior to beginning excavation, grading, and embankment operations.

C. Processed, watered, and compacted to not less than 98% of modified Proctor density (ASTM D1557) at optimum moisture content ±2%, to a depth of 12” minimum.

D. Material that cannot be processed satisfactorily to meet these specifications shall be considered unsuitable.

3.02 GRADING

A. Provide uniform slopes and rounded changes in slope, free of low spots.

B. The degree of grade control shall not deviate from true grade and profile more than one-half inch as measured by a ten-foot straight edge.

C. Drainage:
1. Provide and maintain positive surface water drainage around and away from open excavations.
2. Keep opened excavations dry.
3. Remove free water in excavation promptly.

3.03 FIELD QUALITY CONTROL

A. Sample and Test:
1. At intervals not to exceed 200 feet.
2. At locations designated by the Engineer.

END OF SECTION

SECTION 31 23 18

ROCK EXCAVATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section includes requirements for rock excavation in trenches, pits and open excavations.

1.02 CLASSIFICATION OF ROCK EXCAVATION

A. Excavation to required subgrade elevations or trench dimensions will be classified as either "rock excavation" or "unclassified excavation."

1. **Rock Excavation** includes all materials which, in the opinion of the Engineer, require barring, wedging and/or special impact tools such as hydraulic rock hammers, jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock for removal from their original beds and which have compressive strengths in their natural undisturbed state in excess of 300 psi. Boulders or masonry larger than one cubic yard in volume are classed as rock excavation.

2. **Rock Excavation Field Tests:** Rock excavation is material that meets any one of the following field test criteria:

a. Ripping Test: Material that cannot be broken down by one pass with a single tooth ripper mounted on a crawler-type tractor in low gear with a minimum net flywheel power rating of 255 hp.

b. Seismic Test: Material that has a seismic velocity greater than 6,000 feet/second. Submit the qualifications of the person performing and interpreting the seismic testing for Engineer approval at least 14 days before testing. Perform the Ripping Test to resolve differences in material classification if seismic velocities fall below 6,000 feet/second.

c. Handling Test: Rock with a volume greater than 1 cubic yard that cannot be readily broken down with excavation equipment.

3. **Unclassified Excavation** includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with soil and other materials encountered that are not classified as rock or unauthorized excavation. Unclassified Excavation includes excavation done with intermittent drilling or ripping performed solely to increase production, but not necessary to permit excavation of material encountered.

1.03 RELATED WORK

A. Section 01 29 00 – Payment Procedures.

1.04 VERIFICATION

A. If verification is required, Contractor shall employ a Geotechnical Firm to perform rock excavation field tests and verify quantity and depth of rock excavation at no additional cost the Owner. These field tests are not part of material testing specified under Section 01 45 23 – Testing Laboratory Services.

B. The quantity of detached rocks and boulders shall be measured before they are incorporated into earth haul. Rock material that is not measured and is incorporated into the earth haul will be considered Unclassified Excavation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SITE CONDITIONS

A. Classification and Quantity: Make investigations and determinations necessary to determine the classification and quantities of rock excavation and the methods to be used to excavate these materials.

B. Determination of Classification: If difficult excavation conditions are encountered within defined limits, they will be classified as "Rock Excavation" if mutually agreed upon by the Contractor's superintendent and the Owner's Resident Project Representative at the time the condition is encountered, and the Contractor will be paid at the rock excavation unit bid price. If the Contractor's superintendent and the Owner's Resident Project Representative do not mutually agree on the classification, the Contractor shall demonstrate to the Engineer's satisfaction that the areas in question meet one of the Rock Excavation Field Tests as specified herein.

3.02 BLASTING

A. Blasting of rock is not permitted.

3.03 ROCK EXCAVATION – MECHANICAL METHOD

A. Excavate rock using mechanical methods.
   1. Cut away rock at bottom of excavations to form level bearing that follows natural strata. Form with sharp steps.
   2. Remove final layers carefully to provide sound and unshattered base for footings and foundations as needed.
   3. Remove boulders and fragments that may slide or roll into excavated areas.

PART 4 PAYMENT

4.01 MEASUREMENT

A. Unit of Measurement for Rock Excavation in Trenches: Linear foot of trench, or as specified otherwise in the Bid Form.

B. Unit of Measurement for Rock in Open Excavations: Cubic yard, or as specified otherwise in the Bid Form.

4.02 PAYMENT ITEMS

A. Payment for ROCK REMOVAL and DISPOSAL will be at the Contract unit price for Rock Excavation. The unit price will be full compensation for labor, material, equipment, and work required for verification, drilling, excavation, loading, dumping, and spreading rock material; forming embankments; shaping and trimming slopes and surfaces; and replacing with specified fill.

END OF SECTION

SECTION 31 23 23.33

FLOWABLE FILL BACKFILL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Trench Backfilling

B. Bedding of Buried Pipes

1.02 SUBMITTALS

A. Flowable fill mix design.

B. Testing laboratory results on mix design to demonstrate compliance with specifications.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bedding Materials: Refer to Section 31 23 33 – Trenching and Backfilling.

B. Backfill Material - Flowable Fill:
1. Backfill materials are those materials placed in the trench between the bedding material and the top of the trench.

C. Materials Not Allowed: Refer to Section 31 23 33 – Trenching and Backfilling.

2.02 CONCRETE MIX - BACKFILL MATERIAL (Lean Backfill, Digable Material For Filling Excavations)

A. Comply with ASTM C94, and ASTM C150, Portland Type I-II, low alkali.

B. Portland Cement Content: Quantity sufficient to meet specified compressive strength range.

C. Compressive Strength:
1. Compressive strength requirement shall be fully achieved in time indicated.
2. Compressive Strength at 28 days: 35 psi minimum, 60 psi maximum when sampled and tested as specified in Part 3.
3. Concrete shall not exceed maximum compressive strength because it shall be capable of being excavated with a backhoe tractor without any problems.

4. Concrete that does not meet the specified strength in the specified time is not acceptable regardless of what strength it may later demonstrate, and at the Engineer's sole discretion:
   a. Shall be removed and replaced at the Contractor's sole expense, or
   b. May be allowed to remain as part of the project, but the Contractor will not be paid for the total in-place cost of the concrete.

D. Admixtures:
1. Batching method and time of introduction shall be in accordance with the manufacturer's recommendations for compliance with this specification.
2. Use of a water reducing admixture is optional.
3. Calcium chloride shall not be used.
4. Air Entraining Admixture: ASTM C260, 2 to 5 percent air.

E. Combined Aggregate Gradation:

SCREEN SIZE	% PASSING
1 in.	100
¾ in.	95-100
3/8 in.	82-100
no. 4	70-100
no. 8	55-85
no. 16	38-60
no. 50	6-30
no. 100	2-10

F. Slump: 5" to 8"

G. Fly Ash: Class "C" or "F" fly ash as specified in ASTM C618 may be proportioned in the cementitious material as required to improve pumpability.

2.03 CONCRETE MIX – BACKFILL MATERIAL (Cement Slurry Mix For Filling Voids)

A. Comply with ASTM C94, and ASTM C150, Portland Type I-II, low alkali.

B. Cementitious Material Content: 141 to 235 lbs./cu. yd.

C. Compressive Strength:
1. Compressive strength requirement shall be fully achieved in time indicated.
2. Compressive Strength at 28 Days: 50 psi minimum, 150 psi maximum when sampled and tested as specified in Part 3.
3. Concrete that does not meet the specified strength in the specified time is not acceptable regardless of what strength it may later demonstrate, and at the Engineer's sole discretion:
   a. Shall be removed and replaced at the Contractor's sole expense, or

b. May be allowed to remain as part of the project, but the Contractor will not be paid for the total in-place cost of the concrete.

D. Admixtures:
1. Batching method and time of introduction shall be in accordance with the manufacturer's recommendations for compliance with this specification.
2. Use of a water reducing admixture is optional.
3. Calcium chloride shall not be used.
4. Air Entraining Admixture: ASTM C260, 8 to 30 percent air.

E. Combined Aggregate Gradation:

SCREEN SIZE	% PASSING
3/8 in.	100
no. 4	90-99
no. 8	60-95
no. 16	45-80
no. 50	10-40
no. 100	5-45

F. Fly Ash: Class "C" or "F" fly ash as specified in ASTM C618 may be proportioned in the cementitious material up to 150 lbs./cu.yd. to improve pumpability.

PART 3 EXECUTION

3.01 INSPECTION

A. Refer to Section 31 23 33 – Trenching and Backfilling

3.02 BATCHING, MIXING AND DELIVERY

A. Ready-Mixed Concrete: ASTM C 94.

B. Field Batched Concrete: ASTM C 685.

C. Delivery Ticket: Deliver to Owner's Field Representative prior to unloading at site.
1. Name of flowable fill supplier.
2. Delivery ticket number.
3. Date of delivery.
4. Name of Contractor.
5. Name or location of project.
6. Design mix number.
7. Volume of flowable fill in load.
8. Time loaded.
9. Batched weight of cement, fly ash, fine aggregate, coarse aggregate.
10. Batched weight or volume of admixtures and water.

11. Reading of mixer drum revolution counter at start of mixing.
12. Certification that materials delivered are same brand, type and source as those defined in the design mix authorized by the Engineer.
13. Target proportions of the design mix.
14. Weight or volume of water added at the job site.
15. Signature and name of person who authorized addition of water after leaving the batch plant, and affiliation to the project.

3.03 PLACING

A. Secure utility pipe from movement and flotation.

B. Place flowable fill uniformly without voids or segregation.

C. Place flowable fill in lifts not exceeding 4'in height. Do not place over previous lift until previous lift has been placed for at least 2 hours.

D. Do not place flowable fill on frozen material, in standing water, or during rain. Protect flowable fill from flooding or disturbance for at least 24 hours after placement.

E. Place flowable fill only when ambient temperature is at least 35°F and rising. When ambient temperature at the time of placement is less than 40°F, the temperature of the flowable fill placed shall not be less than 50°F.

3.04 APPLICATION OF LOAD

A. Do not place any load on flowable fill until it exceeds a penetration resistance of 12 psi.
   1. Penetration resistance will be considered acceptable if a person weighing at least 150 pounds, by using his body weight as an axial load on a 3.5" x 3.5" wooden block, cannot penetrate the material more than 1".

3.05 FIELD QUALITY CONTROL

A. Field quality control is required to insure compliance with the project requirements. All portions of the field quality control sampling and testing shall be performed by the testing laboratory selected by the Contractor and accepted by the Engineer.

B. Field quality control testing shall include but not be limited to the following:
   1. Sampling: ASTM C 172.
   2. Test Sample:
      a. Frequency: One for each 150 CY or each day's placement, whichever is greater.
      b. Field Tests:
         1) Slump: ASTM C 143.
         2) Air Content: ASTM C 231.

3) Unit Weight: ASTM C 138.
4) Temperature

c. Compression Tests:
1) Sample: Do not use material from the field tests.
2) Molds: 4” diameter x 4.5” high, free-draining at base, ASTM D 558.
3) Initial Field Curing: 24 +/- 4 hours in mold, ASTM C 31.
4) Laboratory Curing: After initial curing, extrude from mold and cure in laboratory per ASTM C 192, do not cure in curing tank.
5) Number of Specimens: Four (4); test 1 at one (1) day, 1 at seven (7) days, and 2 at twenty eight (28) days.
6) Compression Testing: ASTM D 1633.

3. Reporting:
a. Written report to Engineer within four (4) days of completion of a test.
b. Non-complying Test Results: Notify Engineer within one (1) working day after completion of a test.

3.06 SCHEDULE

A. Backfill with lean backfill and cement slurry mix where indicated on Drawings.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Trenching, Backfilling, and Compacting for Buried Pipes and Manholes

B. Bedding of Buried Pipes

C. Pipe Marking Systems

1.02 REFERENCES

A. ASTM C12 – Installing Vitrified Clay Pipe Lines

B. ASTM D256A – Determining the Izod Pendulum Impact Resistance of Plastics, Method A

C. ASTM D638 – Tensile Properties of Plastic

D. ASTM D695 – Compressive Properties of Rigid Plastics

E. ASTM D790 – Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

F. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))

G. ASTM D1593 – Non-Rigid Vinyl Chloride Plastic Film and Sheeting

H. ASTM D2321 – Underground Installation of Flexible Thermoplastic Sewer Pipe

I. ASTM D2583 – Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

J. ASTM D2774 – Underground Installation of Thermoplastic Pressure Piping

K. ANSI/AWWA C150/A21.50 – Thickness Design of Ductile-Iron Pipe

L. ANSI/AWWA C151/A21.51 – Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids

M. ANSI/AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances

N. ANSI/AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fitting for Water

O. OSHA Regulations, 29 CFR 1926 Subpart P – Excavations

1.03 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
1. Testing laboratory results on bedding materials to demonstrate compliance with specifications.
2. Product data for identification tape, marker posts, tracer wire system, and electronic marker device system, if scheduled.

1.04 JOB CONDITIONS

A. All trenching is unclassified.

B. Protect adjacent structures and surrounding areas.

C. Work to remain within available easements.

D. Weather:
1. No backfill placement during freezing weather.
2. No frozen materials, ice, or snow in backfill or fill.
3. No backfill or fill on frozen surfaces.

1.05 REGULATORY REQUIREMENTS

A. Comply with OSHA Standard 29 CFR Part 1926, Subpart P – Excavations, during all excavation, trenching, and shoring operations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bedding Materials:
1. Bedding materials are those materials located a maximum of 8 inches below bottom of pipe to bottom or spring line of pipe, depending on bedding class or condition required.
2. Material shall be granular and free flowing:
   a. Maximum particle or clump size:
      1) Plastic Pipe 8″ Diameter and Smaller: 0.25″.
      2) All other Pipe: 0.75″
   b. Portion Passing No. 200 Sieve: 50% maximum
   c. Free from refuse, organic material and frozen soils.
3. Materials require prior written approval.
4. Concrete: Division 03.

B. Initial Backfill Materials:
   1. Initial backfill material is that material placed above the bedding material, around and over the pipe to 12″ over the top of the pipe.
   2. Material to be defined and required by applicable ASTM standard for installation for bedding class or type required or scheduled.
   3. In no case shall initial backfill material contain particles or clumps with any dimension greater than:
      a. Plastic Pipe 8″ Diameter and Smaller: 0.25″.
      b. All Other Pipe: 0.75″.
   4. If not otherwise defined, same as bedding material.

C. Backfill Materials:
   1. Backfill materials are those materials placed in the trench between the initial backfill material and the top of the trench.
   2. Material to be as defined and required by applicable ASTM standard for installation for bedding class or type required or scheduled.
   3. Backfill shall have no particles or clumps having a dimension larger than 6″ within 3' of the top of the pipe.

D. Materials Not Allowed:
   1. All pipe bedding, initial backfill, and backfill material shall be clean and free of roots, vegetable or organic material, frozen material, mine tailings, or any contaminants that could endanger public health.

E. Identification Tape:
   1. Identification tape shall consist of high visibility, color coded inert polyethylene tape that is impervious to all known alkalis, acids, chemical reagents and solvents found in the soil.
   2. The tape shall have the following properties:
      a. Minimum Overall Thickness: ASTM D1593: Plain, 4.0 mils; detectable, 4.5 mils.
      b. Minimum Tensile Strength (Longitudinal): ASTM D638: Plain, 1500 psi; detectable, 4,544 psi.
      c. Maximum Imprint Length: 36″.
      d. Width: 3″ for plain tape without metallic foil stripes.
      e. Detectable Tape Metallic Foil Stripes: Permanently laminated to the polyethylene tape so that tape may be more readily located using a metal detector. Refer to Part 3 for application of use. Width: 6″.
   3. Tape to meet the APWA Uniform Color Code for utilities.
   4. Imprinted message, “Caution Buried Utility Line Below”, printed with black letters on APWA approved colors.
   5. Acceptable Manufacturers:
      a. Seton Identification Products, Branford, CT or Engineer reviewed equivalent.

F. Tracer Wire System:

1. Provide tracer wire system as shown on the Drawings and as specified herein.
2. Install single run of tracer wire on top of pipe.
3. Secure wire to pipe every 10′ with pipe wrap tape (tape required to hold wire in place during backfill).
4. Bring wire to surface at every valve box, vault, hydrant, manhole, every 1,000 linear feet, and where shown on Drawings.
5. Terminate wire at surface using a tracer terminal box.
6. All tracer system components such as terminal box cover, wire insulation, and connectors shall be in accordance with APWA Uniform Color Code for utilities.
7. Tracer Wire: #12 AWG, UL listed, 30V single conductor, tracer wire, with 30 mil high density polyethylene (HDPE) insulation.
    a. Copper-clad annealed high carbon 1055 grade steel wire, break load 452 lbs. steel core shall be manufactured in the United States. Copperhead Industries LLC, High Strength HS-CCS, or Engineer reviewed equivalent.
    b. Solid strand copper, Agave Wire LTD, Paige Tracer, or Engineer reviewed equivalent.
    c. If tracer wire is scheduled to be used on utilities installed by horizontal directional drilling, refer to Section 33 05 07.14 – Utility Horizontal Directional Drilling Using HDPE.
8. Pipe Wrap Tape:
    a. Material: 10 mil all weather polyvinyl film.
    b. Durability: Resistant to moisture and corrosive soil.
    c. Adhesion: Adheres to metal and plastic, and conforms to irregularities in substrate surface.
    d. Elongation: 245%.
    e. Tensile Strength: 30 psi.
    f. Width: 2″.
    g. Printed Identification Marking: UPC code, and mil thickness
    h. Acceptable Manufacturer: Northtown Company, or Engineer reviewed equivalent.
9. Tracer Terminal Box:
    a. Copperhead Industries, LLC, Snake Pit Magnetized Tracer Boxes, or Engineer reviewed equivalent.
        1) Light Duty Box: Locate next to structures and not subject to direct damage (such as adjacent to a fire hydrant).
        2) Roadway Box: Locate in or adjacent to road and subject to road traffic.
        3) Concrete/Driveway Box: Locate in areas of concrete pavement.
10. Corrosion-Resistant Wire Connectors:
    a. Direct bury twist-on wire nuts, prefilled with dielectric silicone. For use when connecting between spools (2 conductors max.). Copperhead Industries, LLC, Agave Wire LTD, or Engineer reviewed equivalent.
    b. Direct bury lugs, prefilled with dielectric silicone. For use when connecting to terminal electrical box. Copperhead Industries, LLC, Agave Wire LTD, or Engineer reviewed equivalent.

c. Acceptable for use in place of wire nuts and/or lugs, Copperhead Industries, LLC, twist locking, watertight connectors, with dielectric silicone, or Engineer reviewed equivalent.

11. Test for electrical continuity after installation. Provide test reports to Engineer for review.

G. Utility Marker Posts:

1. Description: Flexible, single piece marker having flat cross-section with three reinforcing ribs and pointed end.
2. Material: Composite flexible glass fiber-reinforced polymer with UV-resistant outer shell, serviceable from -40ºF to 140ºF.
3. Physical Properties:
   a. Tensile Strength, ASTM D638: 30,000 psi min.
   b. Tensile Elongation, ASTM D638: 2% min., 10% max.
   c. Compressive Strength, ASTM D695: 30,000 psi min.
   d. Notched Izod Impact Strength, ASTM D256A: 50 ft.-lb./in. min.
   e. Barcol Hardness, ASTM D2583: 50 min.
   f. Flexural Strength, ASTM D790: 30,000 psi min.
   g. Flexural Modulus, ASTM D790: 1,000,000 psi min.
4. Dimensions: 3.75″ wide x 5′ - 2″ long.
5. Color: Standard APWA color code, integral pigment.
6. Decal: Standard, non-reflective message for utility to be identified, standard APWA background color, UV-resistant, factory installed.
7. Accessories: Flexible anchor barb, factory installed.
8. Acceptable Manufacturers: Carsonite Division of Ametek, Inc. or Engineer reviewed equivalent.
9. Refer to Part 3 for application of use.

PART 3 EXECUTION

3.01 INSPECTION

A. Field verify location of underground utilities and obstructions.

3.02 CLEARING AND GRUBBING

A. General: Clear and grub all areas within the construction limits that will be disturbed by trenching or stockpiling.

B. Clearing: Remove and dispose of trees and other vegetation, downed timber, snags, brush, and rubbish within areas to be cleared.

C. Grubbing: Remove stumps, matted roots, and roots larger than 2″ in diameter from areas to be excavated and from within 6-inches of surface of areas to receive stockpiled material. Do not allow grubbed material to mix with trench backfill.

D. Disposal: Properly dispose of all waste material in accordance with Section 31 23 00 – Excavation and Fill.

3.03 DEWATERING

A. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, and other parts of the Work.

B. Keep excavation dry during subgrade preparation and continuously thereafter until the structure to be built or the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation or other cause will result.

C. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12″ below the bottom of the excavation.

D. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property.

E. Contractor is responsible for the condition of any pipe or conduit he uses for drainage; all drainage pipes, ditches, etc. shall be left clean and free of sediment.

3.04 BLASTING

A. Blasting is not allowed.

3.05 SHEETING

A. If used, cut off at top of pipe and leave in place unless removal is specifically reviewed by Engineer.

3.06 STABILIZATION

A. Thoroughly compact and consolidate trench bottoms so they remain firm, dense, and intact during required construction activities.

B. Remove all mud and muck during excavation.

C. Reinforce trench bottom with crushed rock or gravel if it becomes mucky during construction activities.

D. Allow no more than 1/2″ depth of mud or muck to remain on trench bottoms when pipe bedding material is placed thereon.

E. Where trench bottoms-out in rock, rock is to be removed to 8″ below bottom of pipe and replaced with bedding material.

3.07 TRENCH EXCAVATION

A. Slope, bench, or support all trenches in conformance with OSHA Excavation Regulations, and follow all specified safety requirements.

B. Do not open more trench in advance of pipe laying than is necessary to expedite the Work; not more than 400′, unless otherwise authorized by Engineer.

C. Except where jacking and boring is indicated on the Drawings, specified or permitted by Engineer, excavate trenches by open cut from the surface.

D. Alignment, Grade, and Minimum Cover:
1. Establish alignment and grade or elevation from offset stakes.
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. Comply with pipe specification sections regarding vertical and horizontal alignment and max joint deflection.
4. Water lines to have minimum bury as shown on the Drawings, and in general, grade shall follow surface contours unless otherwise shown on the Drawings.

E. Limiting Trench Widths:
1. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, embedment.
2. If needed to reduce earth loads to prevent sloughing cut banks back on slopes which extend not lower than 1′ above the top of the pipe.
3. Trench widths and minimum clearances between installed pipe and trench wall:

Pipe Size	Minimum Trench Width	Minimum Clearance	Maximum Trench Width at Top of Pipe
18″ or less	O.D. plus 16″	8″	O.D. plus 24″
Larger than 18″	O.D. plus 24″	12″	O.D. plus 24″

F. Mechanical Excavation:
1. Do not use where its operation would damage trees, buildings, culverts, or other existing property, structures, or utilities above or below ground; hand-excavate only in such areas.
2. Use mechanical equipment of a type, design, and construction and operated so that:
   a. Rough trench bottom elevation can be controlled.
   b. Uniform trench widths and vertical sidewalls are obtained from 1’ 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.
   d. Do not undercut trench sidewalls.

G. Cuts in Existing Paved Surfaces:
1. Applies to streets, sidewalks, curbs, driveways, and other existing paved surfaces.
2. No larger than necessary to provide adequate working space.
3. Cut a clean groove not less than 1-1/2″ deep along each side of trench or around perimeter of excavation area.
4. Remove pavement and base pavement to provide shoulder not less than 6” wide between cut edge and top edge of trench.
5. Do not undercut trenches, resulting in bottom trench width greater than top widths.
6. Make pavement cuts to and between straight or accurately marked curved lines parallel to trench centerline or limits of excavation.
7. Where the trench crosses existing paved surfaces, remove and replace the paved surface between saw cuts as specified for pavement.

H. Excavation Below Pipe:
1. Except as otherwise required, excavate trenches below the underside of pipes as indicated on the Drawings to allow placement of granular pipe bedding material.
2. Where excavating in earth for 6″ and smaller pipe, Contractor has the following options for excavating trench bottoms:
   a. Excavate below pipe subgrade and place granular embedment.
   b. Grade trench bottom to provide uniform and continuous support between bell holes or end joints.

I. Excavation for Bell Holes:
1. Excavate to provide adequate clearance for tools and methods of pipe installation.
2. Do not allow any part of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined.

J. Excavated Material: Place stockpiled excavated materials in a manner that will not obstruct work or endanger personnel or the public.
1. Excavated materials shall not obstruct sidewalks or driveways for extended periods of time.
2. Excavated materials shall not obstruct hydrants, valve pit covers, valve boxes, or other utility controls.
3. Excavated materials shall not obstruct gutters, unless other temporary provisions have been made for street drainage.
4. Excavated materials shall not obstruct natural drainage ways.

K. Surplus Excavated Material: Excavated material in excess of that needed to backfill to the limits indicated in the Contract Documents shall be properly disposed off-site in compliance with regulatory requirements at no additional cost to the Owner.

3.08 PIPE BEDDING

A. Class D per ASTM C12

B. Class C per ASTM C12

C. Class B per ASTM C12

D. Crushed Stone Encasement per ASTM C12

E. Class A-I: ASTM C12 Class A-1 using plain concrete.

F. Class A-II: ASTM C12 Class A-1 using reinforced concrete; No. 4 A-36 steel reinforcing bars parallel to pipe with steel area not less than 0.4% of the area of concrete above top of pipe.

G. Class A-III: ASTM C12 reinforced concrete encasement; 3000 psi concrete; No. 4 A-36 steel reinforcing bars; reinforcing parallel to pipe with steel area not less than 0.4% of the area of concrete above and below pipe; reinforcing bars wrapped around parallel bars at 36″ maximum spacing.

H. Bedding class or type as scheduled.

I. Carefully place bedding in accordance with ASTM C12 to provide uniform and continuous support to pipe barrel, except at bell holes in all cases. No bridging will be allowed.

3.09 MANHOLE SUBGRADE

A. Subgrade Material: Use same bedding class as specified for adjacent pipe bedding.

B. Compaction: 90% ASTM D1557.

3.10 TRENCH BACKFILL

A. Material as defined by applicable reference for installation for type of pipe used.

B. Bedding, Initial Backfill, and Backfill: If native materials cannot meet the requirements of Part 2 specified herein or if the specified field compaction cannot be obtained, Contractor shall import suitable material at no additional cost to the Owner.

C. Bedding: Carefully “shovel-slice” or tamp bedding so that the material fills and supports the haunch area under the pipe without voids.

D. Initial Backfill: Place in layers that do not exceed 8″ in height of backfill material in its uncompacted state.

E. Backfill: Place in layers heights suitable to enable the Contractor to achieve the specified compaction throughout the full depth of backfill using Contractor's selected means and methods and without damaging the pipe.

F. Paved Traveled Areas:
   1. 90% ASTM D1557 compaction.
   2. Top 12" below subgrade, 95% ASTM D1557 compaction.

G. Unpaved Traveled Areas and Treatment Plant/Pump Station Sites:
   1. 90 % ASTM D1557 compaction.

H. Untraveled Areas: Compacted to at least undisturbed natural density but not less than 85% ASTM D1557.

I. Water Settled Backfill: Use only where permitted by Engineer:
   1. Where permitted, apply to obtain effective settlement with a minimum of water.
   2. Do not permit trench to overflow.
   3. Do not settle by water puddling until after trench has been backfilled to ground surface.
   4. Introduce water above the pipe embedment through a long pipe nozzle so disturbance of granular embedment or compacted material is held to an absolute minimum.
   5. Add backfill material to compensate for settlement below surface grade and settled during puddling operations.

J. Install identification tape in backfill 24″ directly above top of all buried pipe, unless otherwise scheduled or shown on Drawings. Use tape with metallic foil stripes for all non-metallic pipes.

K. Install Utility Marker Posts as Follows:
   1. Install posts in untraveled areas over centerline of pipe at each horizontal bend made with fittings.
   2. Install face of posts perpendicular to centerline of pipe and facing the downstream direction.
   3. Bury posts 18" deep.

L. Upper 18″ of trench shall contain no particles larger than 6″ in any dimension.

M. Surface Finish:
   1. For placement of paving or gravel surfacing, subgrade where applicable.
   2. Match existing and surrounding contours.
   3. Graded finished appearance.

3.11 FIELD QUALITY CONTROL

A. Section 01 45 23 – Testing Laboratory Services.

B. Section 01 71 23 – Field Engineering.

C. Test Schedule unless otherwise directed by the Engineer:
   1. Minimum of one field density test for each compacted layer of trench backfill for each 250 linear feet of trench in traveled areas.

D. Minimum of one field density test for each compacted layer of trench backfill for each 500 linear feet of trench in untraveled areas.

E. Minimum of two field density tests for each compacted layer of trench backfill at each road crossing.

3.12 PIPE BEDDING SCHEDULES

A. Cast or Ductile Iron Pipe:
   1. Minimum Bedding Class:

Pipe Diameter	Trench Depth To Top of Pipe	Bedding Class
14″ or less	5′ or less	D
	5’ – 12′	C
	More than 12′	B
Larger than 14″	12′ or less	C
	More than 12′	B

B. PVC, HDPE, and Other Plastic Type Pipes:
   1. As recommended by manufacturer.
   2. Minimum bedding class:
      a. Trench depth to top of pipe less than 10′; Class C.
      b. Trench depth to top of pipe 10′ or more; Class B.
   3. Gravity sewer lines bedded to meet maximum deflection requirements given with pipe specifications.

C. Unstable Trench Conditions Due to Groundwater:
   1. Crushed Stone Encasement.

3.13 PIPE MARKING SCHEDULE

A. Identification Tape:

B. Tracer Wire System:
   1. Wire Location:
   2. Payment for Tracer Wire in Place: Refer to Section 01 29 00 – Payment Procedures, Paragraph 1.03.A.3.f.

C. Utility Marker Posts:

1. At bends where fittings are used and at gate valves which are not next to a fire hydrant.

END OF SECTION

SECTION 32 09 00

REMOVAL AND REPLACEMENT OF EXISTING SURFACES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Removal and replacement of existing asphalt and concrete paving, sidewalks, curb and gutter, and driveways removed incidental to the Work of the contract.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):
1. AASHTO T 166 – Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens.
2. AASHTO T 209 – Theoretical Maximum Specific Gravity and Density of Hot-Mix Asphalt Paving Mixtures.

B. American Society for Testing and Materials International (ASTM):
1. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
2. ASTM D2950 – Density of Bituminous Concrete in Place by Nuclear Methods.

C. New Mexico State Department of Transportation (NMDOT):
1. Standard Specifications for Highway and Bridge Construction.

1.03 TESTING AND INSPECTION

A. Representative samples shall be taken from each concrete truck and tested for:
1. Slump
2. Air entrainment
3. Compressive strength (7 day, 14 day, 28 day) (4 cylinders per truck).

1.04 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
1. Product Data.
2. Gradations and other laboratory results.

B. Design mix for asphalt and concrete

C. Certify that materials comply with specification requirements.

D. Testing Laboratory Test Results

PART 2 PRODUCTS

2.01 MATERIALS

A. All replacement materials to be new and of same quality or better than existing.

PART 3 EXECUTION

3.01 REMOVAL

A. Asphaltic and Concrete Paving Material:
   1. Sawcut lines, the full depth of the material, straight and parallel without abrupt jogs, vertical to the surface.
   2. Broken out and removed entirely; rubble to be wasted at an approved location.

B. Sidewalks and Curb and Gutter:
   1. Sawcuts at exiting joints only.
   2. Broken out and removed entirely; rubble to be wasted at an approved location.

C. Gravel Surface and Subgrade Material:
   1. Removed entirely.
   2. May be stockpiled and reused for replacement or removed and wasted at an approved location.
   3. Material for reuse must be clean, free of debris, organic and deleterious substances, and used only with the review of the Engineer.

3.02 PREPARATION FOR REPLACEMENT

A. Subgrade materials same thickness and type as removed.

B. Subgrade compaction as shown on the Drawings, not less than 90% modified Proctor, ASTM D1557.

C. Existing gravel materials to be reused to be clean as required.

3.03 REPLACEMENT SCHEDULE

A. Replacement shall be constructed to conform to existing lines, grades, shape, thickness, and finish, unless otherwise scheduled or shown on Drawings.

B. Asphalt pavement to be placed with laydown machine when practical.

C. Mix design for asphalt pavement shall meet New Mexico Department of Transportation Department Plant Mix Bituminous Pavement (PMBP), Gradation B requirements. Unless indicated otherwise, standard section shall be 4 inches PMBP (2-lifts) on 6 inches compacted base course and 12 inches of subgrade preparation.

D. Quality Control for Asphalt Pavement Compaction:

1. Monitor the compaction process by determining the density of the PMBP with a portable nuclear density test device in conformity with ASTM D2950. Calibration of the portable nuclear device shall be established from cut pavement samples. The density readings of the cut pavement samples shall be determined in accordance with AASHTO T 166 (weight, volume method) and the density readings of the pavement shall be determined by the portable nuclear density test device in conformity with ASTM D2950 and shall be correlated by the test lab. Conduct three density tests for each 500 sy, or fraction thereof, of each lift each day.
2. The range density for acceptance of PMBP shall be 95% (±3%) of the theoretical maximum density as determined from AASHTO T 209.

E. Concrete pavement, curb and gutter and gutter and sidewalks shall conform to Division 03, except the minimum 28-day compressive strength shall be 3,000 psi. Unless indicated otherwise, standard section shall match existing thickness (minimum 4 inches on 6 inches compacted base course and 12-inches of subgrade preparation.) Sections for concrete sidewalks do not require base course.

F. Base course mix design shall conform to the New Mexico Department of Transportation, Standard Specifications for Highway and Bridge Construction, current edition-Section 303, gradation I.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Placement of crushed aggregate base course to the depths and grade as indicated on the plans or listed on the bid form.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T 11 – Amount of Material Finer Than 75-um (No. 200) Sieve in Mineral Aggregates by Washing.
2. AASHTO T 27 – Sieve Analysis of Fine and Coarse Aggregates.
3. AASHTO T 89 – Determining the Liquid Limit of Soils.
4. AASHTO T 90 – Determining the Plastic Limit and Plasticity Index of Soils.
5. AASHTO T 96 – Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine.
6. AASHTO T 104, Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.

B. American Society for Testing Materials International:
1. ASTM D1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
2. ASTM D6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.03 QUALITY ASSURANCE

A. Allowable Tolerances:
1. Thickness: In place compacted thickness will not be acceptable if exceeding 1″, plus or minus from thicknesses shown on Drawings.
2. Surface Smoothness:
   a. Test finished surface of base course for smoothness, using a 10′. straightedge applied parallel to and at right angles to centerline of roadway.
   b. Check surfaced areas at intervals directed by Engineer.
   c. Surfaces will not be acceptable if exceeding 3/8″ in 10′.

B. Testing Laboratory:
1. Contractor will provide material testing for quality control during crushing and laying operations.

C. Sieve Analysis:

1. The grading of the combined aggregates shall be within the designated limits, and shall not vary from the high percentage passing area on one sieve to the low percentage passing on an adjacent sieve. The material shall be uniformly graded from coarse to fine as indicated by a plot on a standard power gradation chart, and reviewed by the Engineer.

1.04 SUBMITTALS

A. Certificates:

1. Provide certificates.
2. Certify that materials comply with specification requirements.
3. Signed by material manufacturer and Contractor.

B. Samples:

1. Provide samples of materials to laboratory for testing prior to placing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate for Base Course:

1. Coarse Aggregate: Sound, angular crushed stone, crushed or screened gravel.
2. Fine Aggregate: Well graded natural sand or stone screenings.
3. The several aggregate fractions shall be sized, uniformly graded, and combined in such proportions that the resulting composite mixture meets the following requirements when tested in accordance with AASHTO T 11 and T 27:

Sieve Size	Percentage of Weight Passing
1″	100
3/4″	80-100
No. 4	30-60
No. 10	20-45
No. 200	3-10

4. Resistance to Abrasion: Wear of 50% or less as determined by AASHTO T 96.
5. Soundness (coarse aggregate): Loss of 18% or less as determined by AASHTO T 104 (Magnesium Sulfate).
6. Liquid Limit: 25 or less as determined by AASHTO T 89.
7. Fractured faces: 50% or more of all plus No. 4 sieve material shall have 2 fractured faces (minimum).
8. Plasticity Index: 6 or less as determined by AASHTO T 90.

PART 3 EXECUTION

3.01 PREPARATION

A. Proof Roll:
   1. Proof roll prepared subgrade surface using heavy, rubber-tired rollers.
   2. Check for unstable areas.
   3. Check for areas requiring additional compaction.

B. Loose and Foreign Material:
   1. Remove loose and foreign material from compacted subgrade surface immediately before placing aggregate base course.
   2. Use power brooms or blowers, and hand brooming as required.
   3. Do not displace subgrade material.

C. Moisture Content:
   1. Do not place aggregate base course when the moisture content of the top 6″ of subgrade exceeds +2% optimum as determined by ASTM D1557.

3.02 MIXING AND PLACING

A. Provide a homogeneous mixture of unsegregated and uniformly dispersed materials as placed in position for compacting.

B. Plant and equipment shall be adequate in all respects.

C. Mix and place base course materials by the following method:
   1. Stationary Plant Method:
      a. Mix base course material and water in an approved mixer.
      b. Add water during mixing operation in the amount necessary to provide the optimum moisture content for placement plus or minus two percentage points.
      c. After mixing, transport the base course material to the job site while it contains the proper moisture content.
      d. Without delay, spread the base course material uniformly on the subgrade so that when compacted, it will conform to the finish thickness.

3.03 SHAPING AND COMPACTING

A. Compacted Thickness:
   1. Maximum compacted thickness of any one layer: 6″.

B. Compact to not less than 96% of maximum dry density as determined by ASTM D1557.

C. Start rolling at the edge and proceed toward the center, except on superelevated curves, roll from the lower to the upper side.

D. Continue blading, wetting, and rolling until a dense, smooth, unyielding and well-bonded base course is obtained for the full width and depth.

3.04 FIELD QUALITY CONTROL

A. Field control of density of in-place material will be determined in accordance with Nuclear Method, ASTM D6938.

B. Field control of moisture content of in-place material will be determined in accordance with Nuclear Method, ASTM D6938.

C. Sample and Test:
1. Each layer of base course.
2. At intervals not to exceed 200 linear feet.
3. Sampled after base course has been mixed, laid down and initial compaction operation has begun.
4. At locations directed by the Engineer.

3.05 SCHEDULE

A. New Mexico Department of Transportation crushed aggregate base course gradation I-B may be used for this project in place of the gradation and material properties specified in Part 2. Gradation and material properties must be current and certified by the New Mexico Department of Transportation. Thickness shall be as indicated on the Drawings.

END OF SECTION

SECTION 33 05 07.14

UTILITY HORIZONTAL DIRECTIONAL DRILLING USING HDPE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, equipment, tools, and materials required to perform horizontal directional drilling (HDD) in a good, workmanlike manner, as indicated on the Drawings, and pull-back installation of a high density polyethylene (HDPE) potable water line as indicated on the Drawings.

B. Coordinate with the trade that is performing the Work specified under Section 33 12 01 – Water Systems.

C. HDD operations include, but are not necessarily limited to, site preparation, equipment setup, pilot bore drilling, reaming and pulling product pipe through the reamed bore, and site restoration.

1.02 RELATED WORK

A. Section 31 23 33 – Trenching and Backfilling.

B. Section 33 12 01 – Water Systems.

1.03 QUALITY ASSURANCE

A. Subcontractor Experience: HDD work shall be performed by an experienced subcontractor specialized in HDD work.
   1. Key Personnel shall have at least 4 years of experience with HDD projects equal in size and scope to this project.
   2. Equipment operators shall have performed at least 3 directional bores of at least 8″ pipe diameter, 1,000-foot bore length, and in similar soil conditions.

B. Operator Training: Equipment operators shall have been trained by the equipment manufacturer. Submit documentation of training to Owner.

C. Industry Standards: All HDD work shall conform to “Guidelines For A Successful Directional Crossing Bid Package”, latest edition, published by the Directional Crossing Contractor’s Association (DCCA).

D. Product Pipe Handling: Store, handle, and install product pipe and appurtenances in accordance with pipe manufacturer’s recommendations and guidelines. Check roundness of pipe prior to accepting delivery. Do not exceed recommended pull

force. Replace any portion of pipe that has been overstressed beyond the manufacturer's recommendations.

E. Contractor Support: Provide technical support, tool suppliers and required support systems to the HDD subcontractor.

F. Regulations: Perform all HDD work in accordance with all applicable local, state, and federal regulations.

1.04 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
1. Prior to commencing work:
a) Qualifications of personnel proposed to perform HDD work, including year of experience and summary of similar past projects.
b) Certificates of inspection of the proposed drill pipe by the drill pipe manufacturer certifying the proposed drill pipe meets the grade and strength required for the drilling conditions indicated in the Contract Documents.
c) Drilling Work Plan which defines drilling procedures for each crossing, including entry and exit points, drill path and depths, drilling and reaming diameters, materials proposed to be used in the drilling operation, proposed laydown areas, pipe staging areas during pullback, site access paths, and drill pit size and locations.
d) Proposed schedule for performing HDD for all crossings.
e) Environmental Protection Plan which defines methods to contain and clean up drilling mud, cuttings, and other fluids.
f) Technical criteria for the compatibility of the proposed drilling mud and additive materials with the native soils and proposed source water.
2. At completion of work:
a) As-built survey documentation showing horizontal and vertical location of installed piping based on drill head locator readings, and locations of any abandoned-in-place bores or other items.
b) Log of data from the locator/tracking system, including:
1) Location and Depth Recorded Every 10′.
2) Position.
3) Roll Angle.
4) Tilt Angle.
5) Temperature of Data Transmitter.
6) Remaining Battery Life.
7) Maximum Pull-Back Force.

PART 2 PRODUCTS

2.01 GENERAL

A. Directional drilling equipment shall be of adequate commercial size and satisfactory working condition for safe operation.

B. Control direction of drilling with electronic tool directional system with wireline guidance.

C. Completely seal around entire installed product pipe with bentonite clay slurry.

D. Provide all equipment and materials to complete the work and protect the site.
   1. Provide generator and portable lights to continue the work without interruption if the operation extends beyond daylight hours.
   2. Provide a standby vacuum truck of adequate size collect and hold drilling fluid if it is spilled or leaks to the ground surface.

E. Transition couplings Transition couplings between HDPE and ductile iron pipe shall consist of HDPE flanged ends butt fused onto plain HDPE end or restrained mechanical joint adapter. HDPE end shall match pressure rating and dimension ratio of host HDPE pipe.

2.02 MATERIALS AND EQUIPMENT

A. Directional Drilling Equipment:
   1. Drill Head: Employ fluid cutting technique.
   2. Drill Machine: Maxi-HDD size capable of installing 8″ HDPE at a drill distance as shown on Drawings.
   3. Pull-Back Monitoring: Capable of measuring and recording pull-back force. **Contractor Note:** the safe pull-back load on HDPE is time dependent. Do not exceed safe load recommended by pipe manufacturer.
   4. Hydraulic Power System: Leak-free.
   5. Machine Setup: Anchor drilling machine to the ground to withstand the reaction forces required to complete the HDD installation.

B. Drill Pipe:
   1. Steel Grade: API steel drill pipe, range 2, premium class or higher, Grade S-135.
   2. Diameter and Wall Thickness: Sufficient for torque, longitudinal loads, fluid capacities, and minimum radius of curvature required for the work.

C. HDPE Product Pipe: Refer to Section 33 12 01 – Water Systems, fusion-bonded joints.

D. Bentonite Drilling Mud:
   1. All drilling fluids shall be adequate for the soil and groundwater conditions on this project, as determined by the HDD subcontractor.
   2. Totally inert and pose no environmental risk.
   3. Disposal: Properly dispose of all drilling fluids off-site in accordance with all local, state and federal regulations.

E. Guidance System:
   1. Capable of continuously and accurately tracking pilot-hole drill head location during the pilot bore in the expected underground environment and at the depths indicated on the Drawings.

2.03 ACCESSORIES AND MISCELLANEOUS ITEMS

A. Tracer Wires: Attach minimum of three 10-gauge solid insulated copper wires at different locations around the product pipe perimeter prior to installation. Furnish and install tracer wire in accordance with the Tracer Wire System specified in Section 31 23 33 – Trenching and Backfilling.

B. Miscellaneous Items: Furnish and install all items for a complete and operable system, whether or not specified herein or shown on the Drawings.

2.04 QUALITY CONTROL

A. Calibrate drill rig and guidance system to verify correct depth of drill prior to HDD installation.

2.05 COORDINATION:

A. Submit specified items that are reviewed and accepted by the Engineer and Owner prior to commencing HDD work.

B. Notify Owner a minimum of 3 work days in advance of starting HDD work.

C. Do not start drilling operations until an Owner's representative is on site.

D. Owner's and Engineer's actions do not relieve Contractor of responsibility of successfully completing HDD work in full conformance with the Contract Documents.

PART 3 EXECUTION

3.01 PREPARATION

A. Site Conditions:
   1. Circulate drilling fluids and cuttings in a closed loop system to minimize the volume of waste fluids generated and needing to be disposed.
   2. Provide equipment and procedures to efficiently separate cuttings from recirculated drilling mud.
   3. Provide 12″ high containment berms around entry and exit points.
   4. Construct mud pits with waterproof liners.
   5. Provide stand-by equipment and materials at the HDD site to contain, collect, and clean up all spills of drilling fluids, lubricants and fuels. Provide such items at no additional cost the Owner. Clean up all spills immediately to the satisfaction of the Owner.

6. Properly dispose of all drilling mud and cuttings pit off-site in accordance with all local, state and federal regulations when decommissioning a mud pit.

3.02 INSTALLATION

A. Pilot Hole:

1. Use an appropriately sized drill pipe and head.
2. Follow the pipe centerline profile indicated on the Drawings within ± 12″ with a smoothly curved pilot hole. Do not exceed the radius of curvature indicated on the Drawings.
3. Entry angle shall not exceed 15 degrees. Exit angle shall be 6 to 12 degrees to facilitate the pullback operation.
4. Continuously monitor location of the pilot hole drill head.
5. Compute x, y, and z position relative to ground surface of the pilot hole drill head every 30′.
6. Document deviations of the recorded position from the required position and promptly notify Owner or Engineer in the event that obstructions are encountered that preclude following the intended drill path.
7. If the pilot hole deviated more than 2% of depth over a length of 100′, Owner may direct Contractor to pull back and re-drill.
8. At no point in the drilled profile shall the radius of curvature be less than 150 times the outside diameter of the HDPE product pipe.
9. When requested, Contractor shall submit to the Engineer the data generated by guidance system in a form suitable for independent calculation of the pilot hole profile.
10. The actual exit point shall fall within a planned exit pit which shall be a rectangle measuring 20′ wide by 100′ long.

B. Reaming:

1. Do not begin reaming operation until receive written permission from the Owner.
2. Ream a borehole diameter a minimum of 25% greater than the outside diameter of the HDPE product pipe to accommodate the pull-back operation and removal of cuttings with minimum displacement of soil.
3. Select the type of reamer head based on the soil conditions encountered in drilling the pilot hole.

C. Pipe Pull-Back Operation:

1. Assemble and join HDPE product pipe in a continuous string on ground positioned for the pull-back operation.
2. Use non-abrasive rollers and side-booms or cranes to support the bottom quarter points of the pipe approximately every 20′ to assist free movement of pipe during pull-back.
3. Install barrel reamer and swivel on pulling face of the product pipe.
4. Close the lead end of the pipe during the pull-back operation.
5. Pull back pipe in one, continuous operation to its final position, without interruption except to remove drill pipe.

6. Pull pipe nose out of hole 3-4% longer than the total length of the pull.
7. Observe pipe manufacturer's recommended relaxation time period before making connections.
8. Immediately correct situations that may damage the pipe and repair any damage prior to pulling.
9. Continuously monitor the pulling force. Do not exceed the safe load recommended by the pipe manufacturer. Install a break-away face on the pull head to limit the pull force to a safe load.
10. Remove and repair all buckled sections of pipe at no additional cost to the Owner.
11. If pulling stresses deform the pipe by more than 10%, Owner may direct Contractor to abandon the bore and re-drill.

D. Pipe Handling:
1. Refer to Section 33 12 01 – Water Systems.
2. Handle pipe in a manner that does not over-stress or buckle the pipe.
3. Use straps or slings to handle the pipe. Do not use chains or cables.
4. Do not allow pipe to rest on rocks or hard surfaces.

E. Handling Drilling Fluids and Cuttings:
1. Properly contain materials at the entry and exit points during HDD operations.
2. Do not allow materials to spill on the ground or discharge into arroyos.
3. Properly dispose of materials off site at a suitable legal disposal site. Obtain any necessary permits for disposal.

3.03 COMPLETION AND CLEANUP

A. Do not backfill entry and exit pits until the installed pipeline has successfully passed the hydrostatic test specified in Section 33 12 01 – Water Systems.

B. Decommission mud pits, backfill all pits, clean up all foreign material, and finish grade ground surface to original contours.

PART 4 PAYMENT

4.01 PAYMENT NOTES

A. Payment for horizontal directional drilling will be made on the basis of linear feet of HDPE pipe installed applied to the unit price for the associated crossing submitted in the Bid Form, unless the horizontal directional drill crossing is itemized as a Lump Sum or Each Unit Bid Item.

B. Payment for tracer wire will be made under the Pipe Detection System and Pipe Marker Bid Item.

END OF SECTION

SECTION 33 05 61.01

UTILITY MANHOLES, FRAMES, AND COVERS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Round utility and piping access manholes complete with frames, covers, and other necessary appurtenances.

B. Manhole valve vaults.

1.02 RELATED WORK

A. Section 03 30 00 – Cast-in-Place Concrete

1.03 REFERENCES

A. American Society for Testing and Materials International (ASTM):
1. ASTM A48 – Gray Iron Castings
2. ASTM C478 – Precast Reinforced Concrete Manhole Sections
3. ASTM C990 – Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

1.04 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
1. Product data.
2. Materials of construction.
3. Dimensioned drawings.
4. Weights.
5. Conformance to referenced standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete: Section 03 30 00 – Cast-in-Place Concrete

B. Precast Sections:
1. ASTM C478.
2. Minimum wall thickness: 4″.

C. Gaskets:
1. Description: Preformed flexible joint sealant.
2. Material: Butyl-rubber and/or refined hydrocarbons, resins, and plasticizing compounds.
3. Conformance: ASTM C990.

D. Access Covers:
1. As indicated on the Drawings and specified or referenced herein.

E. Standard Ring and Cover:
1. Material: Gray cast iron, ASTM A48 class 35 B.
2. Duty: Heavy duty, rated for H-20 truck traffic.
3. Clear Opening: 22″ minimum, or as indicated on Drawings.
4. Vent: Vent opening.
5. Pickhole: Open.
6. Ring Flange: Bottom flange for built-up type installation, top flange where slab style installation is shown on Drawings.
7. Combined Ring and Cover Weight: 260 lb. minimum.
8. Cover Pattern: Word "WATER" cast into center of cover.
9. Seating: Covers to seat at all points on ring. Grind bearing surfaces to prevent rocking.

PART 3 EXECUTION

3.01 FABRICATION

A. Manhole Section:
1. Precast
2. Minimum inside dia.: 48″ or as indicated on Drawings or scheduled herein.
3. Eccentric cones for manholes 6′ deep and greater.
4. Flat, concrete manhole covers for manholes less than 6' deep.
5. Cones: Same or greater reinforcement and wall thickness as manhole section.
6. Joints: Keylock type with preformed gaskets or mastic seal.
7. Manhole clear opening: 22″ minimum, or as indicated on Drawings.

B. Manhole Height Adjustment:
1. Use precast grade adjustment rings.
2. 6″ maximum adjustment height above cone to bottom of ring and cover if manholes require steps.
3. 12″ maximum adjustment height above cone to bottom of ring and cover if manholes do not require steps.

C. Placing Precast Manhole Sections:
1. Clean ends of sections and apply cold bituminous mastic to both sections, or install preformed gasket.
2. Completed manholes shall be rigid.

D. Preformed Gaskets:
   1. Manhole sections with chipped or cracked joints shall be rejected.
   2. Thoroughly clean section joints.
   3. Install gasket in conformance with manufacturer's recommendations.
   4. Only use primer furnished by gasket manufacturer.

E. Interior Manhole Finish - Precast Section:
   1. Remove excess mastic flush with precast sections.
   2. Mortar in joint openings flush with precast sections.
   3. Fill in any chipped areas.

F. Manhole Rings and Covers:
   1. Place rings in bed of mortar on top of manholes.
   2. Ensure no infiltration will enter manhole at this location.
   3. Carry mortar over flange of ring.
   4. Ring setting:
      a. Top to be flush with all surfaces subject to foot and vehicular traffic.
      b. Top to be 4″ above surfaces in open, untravelled areas or as shown on Drawings.

3.02 FIELD TESTING

A. Infiltration Testing:
   1. No visible running or dripping water.
   2. Repair all manholes that do not meet infiltration test.

3.03 SCHEDULE

A. As shown on Drawings.

END OF SECTION

SECTION 33 12 01

WATER SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipes, Materials, Valves, and Appurtenances for buried potable water and non-potable water service or uses as scheduled.

B. Installation.

1.02 RELATED WORK

A. Section 31 23 33 – Trenching and Backfilling

B. Section 33 05 07.14 – Utility Horizontal Directional Drilling Using HDPE

C. Section 33 13 13 – Disinfection of Domestic Water Systems

1.03 REFERENCES

A. American Society for Testing and Materials International (ASTM):
1. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
2. ASTM A307 – Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
3. ASTM A536 – Ductile Iron Castings.
4. ASTM D523 – Test Method for Specular Gloss.
5. ASTM D1248 – Polyethylene Plastics Extrusion Materials for Wire and Cable.
6. ASTM D1784 – Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
7. ASTM D1785 – Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
8. ASTM D2239 – Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
9. ASTM D2241 – Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
10. ASTM D2464 – Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
11. ASTM D2466 – Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
12. ASTM D2467 – Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
13. ASTM D2564 – Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
14. ASTM D2672 – Joints for IPS PVC Pipe Using Solvent Cement.
15. ASTM D2737 – Polyethylene (PE) Plastic Tubing.

16. ASTM D3034 – Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
17. ASTM D3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
18. ASTM D3350 – Polyethylene Plastics Pipe and Fittings Materials.
19. ASTM E8 – Test Methods for Tension Testing of Metallic Materials.
20. ASTM E23 – Test Methods for Notched Bar Impact Testing of Metallic Materials.
21. ASTM F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
22. ASTM F714 – Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.
23. ASTM F2620 – Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

B. American Water Works Association (AWWA):

1. ANSI/AWWA C104/A21.4 – Cement Mortar Lining for Ductile-Iron Pipe and Fittings.
2. ANSI/AWWA C105/A21.5 – Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. ANSI/AWWA C110/A21.10 – Ductile-Iron and Gray-Iron Fittings.
4. ANSI/AWWA C111/A21.11 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. ANSI/AWWA C115/A21.15 – Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges.
6. ANSI/AWWA C116/A21.16 – Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fitrtings.
7. ANSI/AWWA C151/A21.51 – Ductile-Iron Pipe, Centrifugally Cast.
8. ANSI/AWWA C153/A21.53 – Ductile-Iron Compact Fittings.
9. AWWA C207 – Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
10. ANSI/AWWA C213 – Fusion-Bonded Epoxy Coating for the Interior of Steel Water Pipelines.
11. ANSI/AWWA C219 – Bolted, Sleeve-Type Couplings for Plain-End Pipe.
12. ANSI/AWWA C228 – Stainless-Steel Pipe Flange Joints for Water Service – Sizes 2 In. Through 72 In. (50 mm Through 1,800 mm).
13. ANSI/AWWA C303 – Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type.
14. ANSI/AWWA C500 – Metal-Seated Gate Valves for Water Supply Service.
15. ANSI/AWWA C502 – Dry-Barrel Fire Hydrants.
16. ANSI/AWWA C504 – Rubber-Seated Butterfly Valves.
17. ANSI/AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service.
18. ANSI/AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
19. ANSI/AWWA C550 – Protective Interior Coatings for Valves and Hydrants.

20. ANSI/AWWA C600 – Installation of Ductile-Iron Mains and Their Appurtenances.
21. ANSI/AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
22. ANSI/AWWA C700 – Cold-Water Meters – Displacement Type, Bronze Main Case.
23. ANSI/AWWA C701 – Cold-Water Meters – Turbine Type, for Customer Service.
24. ANSI/AWWA C704 – Propeller-Type Meters for Waterworks Applications.
25. ANSI/AWWA C800 – Underground Service Line Valves and Fittings.
26. ANSI/AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm), for Water Transmission and Distribution.
27. ANSI/AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. (19 mm) Through 3 In. (76 mm), for Water Service.
28. ANSI/AWWA C906 – Polyethylene (PR) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks.
29. AWWA Manual M23 – PVC Pipe – Design and Installation.
30. AWWA Manual M55 – PE Pipe – Design and Installation.

C. National Sanitation Foundation International (NSF):
1. NSF/ANSI 61 – Drinking Water System Components – Health Effects.
2. NSF/ANSI 372 – Drinking Water System Components – Lead Content.

1.04 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
1. Product data for pipe materials, including pipe size, dimensions, pressure class, and color; valves, and appurtenances.
2. Non-Toxic and Lead-Free Certification: Written statement that all materials in contact with potable water or raw water supply shall be NSF/ANSI 61 compliant, and shall be lead-free, as certified by the Water Quality Association to comply with NSF/ANSI 372.
3. Manufacturer’s installation instructions for pipe materials.
4. Layout drawings for DIP furnished with ring-type integral buried joint restraint.
5. Submit joint restraint layout drawings of all areas of piping containing bends, fittings, and valves. Indicate proposed method of restraint, such as external devices and integral restrained joints

B. Section 01 78 23 – Operation and Maintenance Data:
1. Operation and maintenance data for valves 4-inches and larger and hydrants.

1.05 GENERAL REQUIREMENTS

A. Pipes, fittings, and materials to be new.

B. Use appropriate equipment and methods for unloading, reloading, hauling and laying pipe as well as proper trench excavation. Use slings with broad, well padded contact surfaces for pipe protection.

C. All pipe of the same type shall be made by the same manufacturer. All fittings of the same type shall be made by the same manufacturer. Pipe manufacturer need not be the same as the fittings manufacturer.

D. Provide labor, equipment, and materials for pipe field testing.

1.06 QUALITY ASSURANCE

A. Ductile Iron Pipe and Fittings:
   1. Tests:
      a. ASTM E8: Tension Testing of Metallic Materials.
      b. ASTM E23: Impact Test.
   2. Marking: Cast on each pipe length.
      a. Weight, class, nominal thickness, and casting period.
      b. Manufacturer's name, year of production, and letters "DI" or "Ductile Iron".

B. PVC Pipe and Fittings:
   1. Tests: ASTM D3034, ANSI/AWWA C900, ASTM D 1784, and ASTM D 1785, as applicable.
   2. Marking: Indelible, in each pipe.
      a. Nominal pipe diameter and cell classification.
      b. Manufacturer's name or trade name, PVC, ASTM and SDR designation, AWWA pressure class, and date of production.
      c. Service designation.
      d. NSF-61 certified.
   3. Gasket rings: Marked with the manufacturer's identification, size, year of production, and classes of pipe in which they are to be used.

C. High Density Polyethylene (HDPE):
   1. Tests: ASTM D2239 or ASTM D2737, ASTM F714, ANSI/AWWA C906, AWWA Manual M55, PPI Handbook of Polyethylene Pipe.
   2. Marking: indelible, each pipe.
      a. Nominal pipe size and material designation
      b. Manufacturer's name or trade name, HDPE, ASTM and DR designation, and date of production.

3. Gasket Rings: Marked with the manufacturer's identification, size, year of production, and classes of pipe in which they are to be used.
4. Fusion: ASTM F 2620

PART 2 PRODUCTS

2.01 MATERIALS AND FABRICATION

A. Ductile Iron:
1. Pipe:
   a. ANSI/AWWA C151/A21.51: ASTM A536, Grade 60-42-10.
   b. Thickness: Pressure Class 350 for pipes 12-inch diameter or smaller; Pressure Class 250 for pipes 14-inch diameter or larger unless otherwise scheduled.
2. Fittings: Cast from ductile iron: ANSI/AWWA C110/A21.10 full body or ANSI/AWWA C153/A21.53 short body.
3. Joints: ANSI/AWWA C111/A21.11:
   a. Mechanical Joint: 350 psi working pressure.
   b. Flange: Also ANSI/AWWA C115/A21.15 and ANSI/ASME B16.42, ductile iron; 150 lb. pattern, unless scheduled otherwise.
   c. Bolts, Tie Bolts, and Nuts:
      1) Low carbon steel, ASTM A307.
      2) Bolts smaller than 3/4-inch: With heavy hex heads for flange and T-head for MJ, and heavy hex nuts.
      3) Bolts 3/4-inch and larger: With hex heads for flange and T-heads for MJ, and heavy hex nuts.
      4) Coating, Exposed Service: Grade B zinc coat per ASTM A153.
      5) Coating, Buried Service: Liquid applied fluoropolymer coating matrix consisting of lubricating compounds, UV stabilizers and coloring agents or pigments, heat cured, 0.7 to 1.0 mil total DFT.
   d. Gaskets for mechanical joint, push-on and flanged joints:
      1) Conformance: ANSI/AWWA C111/A21.11.
      2) Material: Synthetic rubber as specified in referenced standard. Natural or reclaimed rubber not acceptable.
   e. Lubricant: Suitable for potable water use and in conformance with ANSI/AWWA C111/A21.11.
4. Joint Restraint: Furnish external mechanical restraint devices, including restrained flange adaptors for exposed piping as specified herein, or integral joint restraints for buried joints if specified herein. Furnish restraint devices where scheduled or noted on Drawings, as specified in Part 2 of this Specification.
   a. Integral Buried Joint Restraint:
      1) Minimum Pressure Rating: 350 psi to 18-inch, 250 psi to 24-inch, 150 psi to 30-inch.
      2) Gasket Type: U.S. Pipe Field Lok 350® Gasket, American Ductile Iron Pipe Fast-Grip® Gasket or Engineer reviewed equivalent.

3) Ring Type: U.S. Pipe TR FLEX® Joint, American Ductile Iron Pipe Flex-Ring® Joint, American Ductile Iron Pipe Lok-Ring® Joint, or Engineer reviewed equivalent.
4) For gasket-type integral restraint:
a) Pipe manufacturer shall furnish to Contractor two feeler gages capable of determining depth of gasket and presence of metal locking segments.
b) Contractor shall wrap bell of each restrained joint with factory furnished tape with words "Restrained Joint".
c) Pipe manufacturer shall furnish to Contractor two complete kits of extractor shims and shim holders (slotted and curved steel block used to drive the shims with a hammer) for each size of pipe used.

5. Corrosion Protection:
a. Outside Coating (buried or submerged service):
1) Pipe: Bituminous per ANSI/AWWA C151/A21.51.
2) Fittings: Bituminous per ANSI/AWWA C110/A21.10 and ANSI/AWWA C153/A21.53 or fusion-bonded epoxy per ANSI/AWWA C116/A21.16.
b. Inside Coating:
1) Pipe: Cement mortar lined with asphaltic seal coat per ANSI/AWWA C104/A21.4.
2) Fittings: Cement mortar lined with asphaltic seal coat per ANSI/AWWA C104/A21.4 or fusion-bonded epoxy per ANSI/AWWA C116/A21.16.
c. Polyethylene Encasement:
1) Conformance: ANSI/AWWA C105/A21.5.
2) Material: ASTM D4976, Group 2.
3) Configuration: Seamless tube or sheet.
4) Film Requirements:
a) Linear Low-density Polyethylene:
i. Thickness: 8 mil.
ii. Density: 0.910 to 0.935 g/cm^3.
iii. Tensile Strength: 3,600 psi for 8 mil, ASTM D 882.
b) High-density, Cross-laminated Polyethylene:
i. Thickness: 4 mil.
ii. Density: 0.940 to 0.960 g/cm^3.
iii. Tensile Strength: 6,300 psi for 4 mil, ASTM D882.
5) Color: Weather-resistant black containing not less than 2% carbon black.
6) Pipe Wrap Tape:
a) Material: 10 mil all weather polyvinyl film.
b) Durability: Resistant to moisture and corrosive soil.
c) Adhesion: Adheres to metal and plastic, and conforms to irregularities in substrate surfaces.

d) Elongation: 245%.
e) Tensile Strength: 30 psi.
f) Width: 2 inches.
g) Printed Identification Marking: UPC code and mil thickness.
h) Acceptable Manufacturer: Northtown Company, or Engineer reviewed equivalent.

7) Strapping: Non-metallic, water resistant FS PPP-S-760.
8) Install on buried ductile iron piping, fittings, and restraint assemblies in accordance with AWWA C105, unless scheduled otherwise.

B. Polyvinyl Chloride (PVC):

1. Water Service Condition:
   a. Potable Water Service:
      1) Pipe manufactured from compounds certified by the National Sanitation Foundation (NSF).
      2) Color: Blue pigment.
   b. Reclaimed Water Service:
      1) Color: Purple pigment.
      2) Marking: Continuous text, “Reclaimed Water – Do Not Drink”.
   c. Non-Potable Water other than Reclaimed Water Service:
      1) Color: White pigment.
2. Pipe and Fittings:
   a. Pipe sizes 4 inch through 60 inch:
      1) ANSI/AWWA C900.
      2) Pressure class as scheduled.
         a) Class 235 psi (DR 18) minimum for 12 inches and smaller if not scheduled or indicated otherwise.
         b) Class 165 psi (DR 25) minimum for 14 inches and larger if not scheduled or indicated otherwise.
      3) Fittings: Cast from ductile iron; ANSI/AWWA C110/A21.10, full body or ANSI/AWWA C153/A21.53, short body; mechanical joint ANSI/AWWA C111/A21.11, external mechanical restraint devices as specified herein. Encase fittings and all external restraint assemblies with polyethylene encasement per ANSI/AWWA C105, unless scheduled otherwise.
   b. Pipe sizes 3.5-inch and smaller:
      1) Unless otherwise scheduled or shown on the Drawings.
         a) ASTM D2241.
         b) 1.5-inch and smaller: SDR 21.
         c) 2-inch through 3.5-inch: SDR 26.
         d) Pressure rating as scheduled; 160 psi minimum if not scheduled.
      2) If scheduled or shown on the Drawings:
         a) Schedule 40 and 80 Pipe Dimensions and Workmanship: ASTM D1785.

b) Schedule 40 minimum unless otherwise scheduled or shown on Drawings.
c) Material: ASTM D1784, Class 12454-B.
d) Fittings:
i. ASTM D2466, Schedule 40.
ii. ASTM D2464, Schedule 80, threaded.
iii. ASTM D2467, Schedule 80, socket type.

3. Joints:
a. Gasket Bell End: ASTM D3139 for plastic pressure pipes using elastomeric seals.
b. Gaskets: ASTM F477, elastomeric.
c. Solvent Cement Bell End: ASTM D2672.
d. Solvent-Cement: ASTM D2564, NSF approved.
1) Use only where specifically scheduled, shown on Drawings or reviewed by Engineer.

4. Joint Restraint: Furnish external mechanical restraint devices, including restrained flange adaptors, as specified herein, or integral joint restraints for buried joints if specified herein. Furnish restraint devices where scheduled, noted on Drawings, and where specified in this specification.

C. External Mechanical Restraint Devices:
1. Works on principle of multiple wedging action against pipe, which increases its resistance as line pressure increases while maintaining joint flexibility. Set screw devices are not acceptable. Split non-serrated back-up rings behind bells are acceptable. Split serrated restraint rings are not acceptable, except on spigot end of bell restraint harness of C900 PVC pipe up to 12-inches. EBAA Iron Sales, Inc. or Engineer reviewed equivalent.
2. Gland: Ductile iron with dimensions which match standard mechanical joint bells per ANSI/AWWA C153/A21.53, ASTM A536, Grade 65-45-12.
3. Wedges: Heat-treated ductile iron with minimum Brinnel hardness of 370 BHN.
4. Wedges tightened during installation via twist-off nuts.
5. Devices shall be designed for the following working pressure:
a. 250 psi for 18 inch to 48 inch DIP, with 2:1 safety factor.
b. 350 psi for 3 inch to 16 inch DIP, with 2:1 safety factor.
c. Meets or exceeds standardized pressure rating of host PVC piping.
6. Devices shall be designed for the type of pipe material and pipe joint being harnessed.
7. An identification number shall be cast into each gland body with the following information: Date and shift of manufacture, and plant location.
8. All physical and chemical test results shall be made available to Engineer for review upon request by referencing the identification number.
9. Coating for wedges, wedge actuators, bolts, tie bolts, nuts, and related fastener and gripping components:
a. Surface Preparation: Cleaner wash, phosphatizing, rinse, and drying.

b. Coating: Liquid applied fluoropolymer-matrix consisting of lubricating compounds, UV stabilizers, and coloring agents or pigments. Heat cured. Two coats, 0.7 to 1.0 mil total DFT.
c. Low VOC, resin bonded and thermally cured, single film, dry lubricant, primarily formulated for use on fasteners.
d. Designed to prevent corrosion and facilitate make-up torque.
e. Provide lubricity of coating for proper dispersion of PTFE.

10. Coating for Cast Bodies:
    a. Surface Preparation: Cleaner wash, phosphatizing, rinse, and drying.
    b. Coating: Electrostatically applied TGIC polyester-based powder. Heat cured. 1.5 to 4.0 mils total DFT.
    c. Designed to prevent corrosion, impact and UV resistance.
    d. Appearance: Class 5 (orange peel) PCI smoothness standard; 75% to 85% gloss at 60 degrees per ASTM D523; pinhole free.

D. Couplings:
1. Use only where indicated on Drawings or reviewed by Engineer. Do not use where restrained fittings are specified.
2. For buried service, furnish factory-applied fusion-bonded epoxy coating in accordance with AWWA C213, and corrosion-resistant alloy bolts equivalent to Dresserloy.
3. Shall meet AWWA C219: Described by reference to couplings manufactured by Dresser Industries, Inc., Bradford, PA; equivalent couplings by Ford Meter Box, JCM Industries, Romac Industries, or by other manufacturers may be used:
    a. Dresser Style 38 for exposed steel, cast iron, and ductile iron pipe, unless indicated otherwise on Drawings or scheduled.
    b. Dresser Style 253 cast iron couplings for buried steel, cast iron, ductile iron, and asbestos cement pipe, unless indicated otherwise on Drawings.
    c. Dresser Style 40 long couplings where long couplings are indicated.
    d. Dresser Style 62 Type reducing couplings where reducing couplings are indicated.
    e. Dresser Style 162 couplings for transition between different pipe materials.
    f. Dresser Style 63 expansion coupling where expansion coupling is indicated; type as indicated on Drawings or scheduled.
    g. Dresser Style 227 and 128 coupling with flanged adaptor where indicated on Drawings.
    h. Dresser Style 131 dismantling joint.

E. Tapping Saddles and Service Lines:
1. Service Lines 3/4-inch to 3-inch:
    a. Conformance: AWWA C901.
    b. Resin: High density polyethylene (HDPE) PE4710 having minimum cell classification 445474C/E as rated by the Plastic Pipe Institute (PPI) and in conformance with ASTM D3350.

c. Wall Thickness Design:
    1) ASTM D2239, controlled inside diameter, SIDR-9 unless scheduled otherwise, or
    2) ASTM D2737, copper pipe size, SDR-9, unless scheduled otherwise,
    3) Contractor's option unless scheduled otherwise,
    4) Minimum Pressure Rating: 150 psi at 73°F.

2. Joints:
    a. Compression fittings.
    b. Compatible with heavy duty copper service fittings.

3. Tapping Saddles:
    a. AWWA C900 PVC Host Pipe:
        1) Body Material: Bronze or brass.
        2) Strap Material: Type 304L stainless steel.
        3) Style: Two strap.
        4) Rated Working Pressure: At least 200 psig.
        5) Outlet Seal: EPDM O-ring.
        6) Tap Size: As indicated on Drawings.
        7) Conformance: Applicable portions of AWWA C800.
        8) Non-Toxic: NSF/ANSI 61 certified.
        9) Lead Free: Certified by the Water Quality Association to comply with NSF/ANSI 372.
        10) Acceptable Manufacturers: Mueller BR2S, Romac 202BS, Ford 202BSD, or Engineer reviewed equivalent.
    b. Ductile Iron Host Pipe:
        1) Body Material: Ductile iron, ASTM A536 with 10 to 12 mil nylon or epoxy coating.
        2) Strap Material: Type 304L stainless steel.
        3) Style: Two strap.
        4) Rated Working Pressure: At least 200 psig.
        5) Outlet Seal: EPDM O-ring.
        6) Tap Size: As indicated on Drawings.
        7) Conformance: Applicable portions of AWWA C800.
        8) Non-Toxic: NSF/ANSI 61 certified.
        9) Lead Free: Certified by the Water Quality Association to comply with NSF/ANSI 372.
        10) Acceptable Manufacturers: Mueller DR2S, Romac 202N, Ford FCD202, or Engineer reviewed equivalent.

4. Corporation Stops:
    a. Material: Bonze or brass.
    b. Style: Ball type, suitable for use with tapping machine.
    c. Rated Working Pressure: At least 300 psig.
    d. Size: As indicated on Drawings.
    e. Conformance: AWWA C800.

f. Threaded Connections: Compatible with tapping saddle.
g. Non-Toxic: NSF/ANSI 61 certified.
h. Lead Free: Certified by the Water Quality Association to comply with NSF/ANSI 372.

5. Curb Stop Valves:
a. Material: Cast brass.
b. Style: Ball type, full port.
c. Rated Working Pressure: 300 psi.
d. Size: As indicated on Drawings.
e. Conformance: AWWA C800.
f. Connections: Compatible with service line material.
g. Ball: Fluorocarbon coated brass ball.
h. Seats: EPDM molded seats with stainless steel reinforcing rings, bi-directional flow.
i. Stem Seals: Two EPDM O-rings.
j. Tee-Head and Stem: Solid, one piece.
k. Tee-Head Rotation: Standard stops on body to permit quarter-turn only.
l. Non-Toxic: NSF/ANSI 61 certified.
m. Lead-Free: Certified by the Water Quality Association to comply with NSF/ANSI 372.
n. Curb Box: Cast iron box and lid with brass pentagon plug, arch style with foot piece, telescoping upper piece for grade adjustment.

F. High Density Polyethylene (HDPE) 3-inch to 54-inch:
1. Conformance: AWWA C906, AWWA Manual M55, PPI Handbook of Polyethylene Pipe.
2. Resin: High density polyethylene (HDPE) PE4710 having minimum cell classification 445474C/E as rated by the Plastic Pipe Institute (PPI) and in conformance with ASTM D3350.
3. Wall Thickness Design: ASTM F714, DR pipe dimension ratio based on controlled outside diameter, DIPS sizing system.
a. Unless scheduled otherwise, DR 11.
4. Joints: Thermal fusion ASTM F2620.
5. Connections to Other Piping and Valves: Fusion bonded HDPE Flange adapters with ductile iron back-up rings, ANSI B16.5 150 lb. flange pattern, or fusion bonded restrained MJ adapters.

2.02 APPURTENANCES

A. Fire Hydrants:
1. Latest revision of AWWA C502.
2. Mueller A-423 Super Centurion 250 or Engineer reviewed equivalent.
3. 1-1/2-inch Pentagon Bronze Operating Nut equipped with elastomer weather seal between the top casting and the operating nut.
4. Sealed oil reservoir will incorporate a system of forced lubrication of the thrust collar area each time the hydrant is operated.

5. Two 2.5 inches and one 4.5 inches nozzles with National Standard fire hose threads mechanically connected into the barrel, “O”-ring sealed and standard nozzle caps.
6. Steel safety stem coupling with stainless steel fasteners, and two-piece break away safety flange.
7. Centerline of hose nozzle will be a minimum of 18 inches above groundline.
8. 5-1/4 inch diameter main valve opening.
9. Upper valve plate shall be all bronze.
10. All internal surfaces of the shoe, the lower valve plate, and cap nut shall be coated with a factory applied two-part, thermosetting epoxy coating with a minimum thickness of 4 mils.
11. The bronze valve seat shall be threaded into a bronze drain ring or shoe bushing. The drain channel shall be all bronze.
12. The hydrant shall have two drain outlets above the lower flange of the hydrant shoe assembly.
13. 250 psi working pressure, and be certified as such by the manufacturer.
14. Lower barrel to shoe connection shall have a minimum of six bolts made of stainless steel.
15. All hydrants furnished shall have a standard 10-year warranty certified by the manufacturer.
16. Painted chrome yellow.

B. Offset Fire Hydrant Connector Pipe:
1. Joints: Fully restrained by means of split M J Glands.
2. Length and Offset: To suit field conditions.
3. Material: DIP, AWWA C153.
4. Interior Lining: Cement mortar AWWA C104.

C. Cold Water Meters:
1. Size as shown on Drawings or scheduled.
2. Displacement type:
   a. AWWA C700.
   b. Invensys Metering Systems.
   c. Or Engineer reviewed equivalent.
3. Displacement Type with Electronic Register, Touchread:
   a. AWWA C 700.
   b. Invensys Metering Systems.
   c. Cases, bolts, washers, all conform to Sensus Technologies specifications.
   d. Or Engineer reviewed equivalent.
4. Each displacement-type meter supplied and installed with:
   a. Meter box with cast iron cover.
   b. Setter.
   c. Corporation stop.
   d. Other installation appurtenances and accessories as shown on Drawings.

5. Turbine Type:
    a. AWWA C701.
    b. Invensys Metering Systems.
    c. Or Engineer reviewed equivalent.
6. Propeller Type:
    a. AWWA C704.
    b. Invensys Metering Systems.
    c. Or Engineer reviewed equivalent.

D. Resilient Wedge Gate Valves 2-24 inches (Buried Service):
1. Size as shown on Drawings.
2. AWWA C509 or AWWA C515.
3. Mueller A-2361 series or Engineer reviewed equivalent.
4. Fully unobstructed, oversize flow way. The sealing mechanism is withdrawn from the flow way in a full open position. No pockets in bottom of flow way to trap sediment or debris.
5. Anti-friction washers above and below the thrust collar portion of stem to reduce friction.
6. Triple O-ring seals on the stem, two above and one below the thrust collar to protect from contamination.
7. A symmetrical rubber encapsulated disc with no exposed iron.
8. Forged bronze stem for added strength and reliability.
9. Coating: AWWA C550 and NSF-61 certified epoxy coating on all interior and exterior cast iron surfaces 10 mils nominal thickness.
10. 2 inch AWWA operating nut.
11. Ends: Mechanical joint, or as required for pipe or as shown on Drawings.
12. Threaded operator: Open left (counter clock-wise) unless scheduled otherwise.
13. Lead Free: Furnish certification as specified in Submittals section of this specification.

E. Butterfly Valves with Actuator (Buried Service):
1. Butterfly valve:
    a. Size as shown on Drawings.
    b. AWWA C504, Pressure Class 150 B 250 B.
    c. Pratt, Dresser, Val-Matic, or Engineer reviewed equivalent featuring ductile iron and offset disc and shaft.
2. Valve actuator:
    a. Manufactured by butterfly valve manufacturer.
    b. Traveling nut type.
    c. Withstand minimum 300 ft-lbs torque at full open or full closed position.
    d. Fully gasketed and sealed.
    e. Withstand 10 psi submergence without leaking.
    f. Minimum 16 turns full open to full closed position.
    g. 2-inch AWWA nut.
3. Coating: AWWA C550 epoxy coating on all interior and exterior ferrous metal surfaces, 16 mils nominal thickness.

4. Threaded operator: Open left (counter clock-wise) unless scheduled otherwise.
5. Ends: Mechanical joint for buried service, unless indicated otherwise on Drawings.

F. Tapping Sleeves:
1. Minimum working pressure: 250 psi.
2. Welded, fabricated type 304 stainless steel body with the following features:
   a. Buna-N rubber gasket, gridded, 360 degree pipe coverage.
   b. Type 304 stainless steel bolts and nuts.
   c. Flat face steel flange per AWWA C228, Class D 150 lb. pattern per AWWA C207.
   d. Test Plug: 3/4-inch NPT, no-lead brass.
3. Ford FTSS, Smith-Blair 663, or JCM 432.
4. Sizes as shown on Drawings.

G. Tapping Valves:
1. Minimum working pressure: 150 psi.
2. Sizes as shown on Drawings.
3. Mueller Type T-2360 Resilient Wedge Gate Valve; Mechanical Joint on outlet side and Flange End on opposite side, or Engineer reviewed equivalent.
4. AWWA C509.
5. AWWA C550 and NSF-61 certified epoxy coating on all interior and exterior ferrous metal surfaces 10 mils nominal thickness.
6. Operator: 2-inch AWWA nut.

H. Inserting Valves:
1. Sizes: As shown on Drawings.
2. Special Conditions: As noted on Drawings.
3. Minimum Working Pressure: 250 psi.
4. Fully restrain valve and host piping.
5. Acceptable Manufacturers:
   a. Advanced Valve Technologies EZ_2.
   b. Hydra-Stop IVP 250 Patriot Series Inserta-Valve.
   c. Team Industrial Services
   d. Or Engineer reviewed equivalent.

I. Pipe Marking Systems: Refer to Section 31 23 33 – Trenching and Backfilling.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:
1. Install as indicated on Drawings.
2. Trenching, Backfilling, and Compacting: Section 31 23 33 – Trenching and Backfilling.

3. Pipe cutting measurement taken at site.
4. Clean all pipe, accessories, and appurtenances before use. Thoroughly clean interior of each section of pipe after installing it in trench.
5. Protection of stored materials: Section 01 66 01 – Product Delivery, Storage, and Handling Requirements.
6. Securely close the end of the pipe at the end of each day or whenever the work ceases with a watertight seal.
7. Take precautions necessary to prevent uplift and floating of the pipe prior to backfilling.

B. Jointing and Assembling, General:
1. Manufacturer's recommendations.
2. Lubricants: Vegetable soap solution suitable for use on potable water systems.
3. Prevent entrance of soil and other contaminants.
4. Use mechanical or push-on for exterior locations.

C. Delivery, Handling, and Storage of PVC Pipe:
1. All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Engineer.
2. Inspect each pipe shipment prior to unloading to see if the load has shifted or otherwise been damaged. Notify Engineer immediately if more than immaterial damage is found. Check each pipe shipment for quantity and proper pipe size, color, and type.
3. Off-load and handle pipe in accordance with AWWA M23 and AWWA C605, and all of the Pipe Supplier's guidelines.
4. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
5. During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.
6. Lower pipe from trucks carefully. Do not drop pipe.
7. Mark as rejected and remove at once from the work any pipe showing a crack or which has received a blow that could have caused an incident fracture, even though no such fracture can be seen.
8. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and shall be rejected unless determined acceptable by the Engineer.
9. Store and place pipe lengths on level ground. Store pipe at the job site in the unit packaging provided by the Pipe Supplier. Exercise caution to avoid compression, damage, or deformation to the ends of the pipe. Keep the interior of the pipe, as well as all end surfaces, free from dirt and foreign matter.
10. Handle and support pipe using woven fiber pipe slings or approved equivalent. Exercise care when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.
11. If pipe is to be stored for periods longer than 90 days, the pipe and gaskets should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe shall be

covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.

12. Store and stack pipe in accordance with the Pipe Supplier's guidelines.

D. PVC Pipe Joint Assembly:

1. Conformance to AWWA C605 – Underground Installation of Polyvinyl Chloride (PCV) Pressure Pipe and Fittings for Water:
   a. Assemble PVC pipe in conformance with AWWA C605, Section 5.5.2 – Joint Assembly, which states:
      1) "Pipe spigot ends are pre-marked at the factory with a circumferential insertion line. This line references how far the spigot should be inserted into the adjoining PVC pipe bell. Field-cut spigot ends shall be marked and beveled to match the manufacturer's insertion line. Pipe-to-pipe joints shall be assembled only to the insertion line. After assembly, the insertion line shall remain visible and be nearly flush with the lip of the adjoining PVC pipe bell. Joints assembled beyond the insertion line shall be considered over-assembled and may result in damaging stresses or leakage."
2. Field Quality Control to Prevent Over-Assembly (Over-Insertion):
   a. If a joint is found to be over-inserted, Contractor shall expose previously assembled joints until properly assembled joints are found. All over-inserted joints shall be properly re-assembled.
   b. Contractor is permitted to use mechanical bell stop devices that meet the following criteria:
      1) Designed specifically to handle pipe insertion forces to prevent insertion beyond the marked insertion line.
      2) Incorporates a resilient expansion retention spring that allows for pipe expansion and contraction.
      3) Ebaa Iron Mega-Stop™ Series 5000 Bell Protection System, or Engineer reviewed equivalent.

E. PVC Pipe Tapping:

1. Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605 and as specified herein. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for Saddle Tapping in accordance with Uni-Pub-08.
2. All connections requiring a larger diameter than that recommended by the Pipe Supplier, shall be made with a pipe connection as specified and indicated on the Drawings.
3. Equipment used for tapping shall be made specifically for tapping PVC pipe:
   a. Tapping bits shall be slotted "shell" style cutters, specifically made for heavy-walled PVC pipe and designed to retain the coupon. "Hole saws" made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.
   b. Manually operated or power operated drilling machines may be used.

4. Taps may be performed while the pipeline is filled with water and under pressure (“wet” tap,) or when the pipeline is not filled with water and not under pressure (“dry” tap).

F. Clean all lines by repeated flushings after installations.

G. Disinfection: Section 33 13 13 – Disinfection of Domestic Water Systems.

H. Pipe Sleeves:
1. For all pipes passing through concrete or masonry.
2. Install before concrete is placed where practical.
3. Sleeve seal: Watertight, modular sealing element when sleeve is placed in slabs with one side against soil.

I. Buried Pipe Anchorage:
1. Furnish and install thrust blocking, anchors, joint restraint devices, or other acceptable means of preventing pipe movement whether indicated or not for:
   a. Unlugged bell and spigot or all unflanged tees.
   b. Y branches.
   c. Bends deflecting 22-1/2 degrees or more.
   d. Plugs.
   e. Fittings in fills or unstable ground.
   f. Above grade or exposed piping.
2. Concrete thrust blocking:
   a. Install so joints are accessible for repair.
   b. Install as shown on Drawings for buried pipe unless otherwise scheduled or reviewed by Engineer.
   c. Use bond breaker, such as 8 mil polyethylene sheets, between concrete and surfaces of all piping, fittings, and appurtenances.

J. Valves: Installed as shown on Drawings with valve boxes and blocking.

K. Fire Hydrants: As indicated on Drawings with concrete supports.

3.02 FIELD QUALITY CONTROL

A. Ductile Iron Pipe: AWWA C600, except as specified otherwise herein.

B. PVC Pipe and Fusible PVC Pipe: AWWA C605 for pressure rated, and AWWA Manual M23, except as specified otherwise herein.

C. HDPE Pipe: AWWA C901, AWWA C906, AWWA Manual M55, and PPI Handbook of Polyethylene Pipe, except as specified otherwise herein.

D. All pipes and fittings tested in presence and to the satisfaction of the Engineer.

E. Test Conditions:

1. Working Pressure: See Schedule.
2. Medium: **Water only**. **Do not test PVC, FPVC or CPVC with air** because pipe failure from pressurized air may result in explosive shards.
3. Unless otherwise scheduled, perform test at 50% greater than working pressure, or 150 psi, whichever is greater, for two hour minimum.

F. Procedure:

1. Coordinate pressure testing with filling, disinfection and flushing procedures as submitted in the Disinfection Plan submittal specified in Section 33 13 13 – Disinfection of Domestic Water Systems.
2. Disconnect fixtures, equipment and accessories which may be damaged by test pressure.
3. Plug ends as required.
4. No installation will be accepted unless the leakage is less than the number of gallons per hour as determined by the following formula, except HDPE waterlines:
   a. L = (N) (D) (P^0.5) / 133,200
   b. Where:
      1) L = allowable leakage in gallons per hour.
      2) N = length of pipeline tested in feet.
      3) D = nominal diameter of pipe in inches.
      4) P = average test pressure during test, psig.
5. HDPE Waterlines: Unless scheduled otherwise, perform test at 50% greater than working pressure.
   a. Fill Phase: Fill the restrained test section completely with water. Evacuate air from all high points.
   b. Initial Expansion Phase: After the piping and water have equalized to a common temperature, gradually pressurize test section to test pressure, and maintain test pressure for 3 hours. During the initial expansion phase, HDPE pipe will expand slightly. Add additional water to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase.
   c. Test Phase: Immediately following the initial expansion phase, reduce test pressure by 10 psi, and stop adding test water. If test pressure remains steady (within 5% of the target value) for 1 hour, no leakage is indicated.
   d. Depressurization Phase: Gradually release the test pressure by controlling the release of water.
   e. Total Test Duration: Limit the time the pipe is pressurized at test pressure to 8 hours. If pipe must be pressurized again to test pressure, depressurize pipe first and allow it to relax for at least 8 hours before repressurizing.
   f. Supervision: Do not leave the test section unsupervised at any time during leak testing.
6. If leakage is indicated, locate and repair leaks.

7. Retest repaired joints, pipes, and fittings until system complies with above criteria for allowable leakage.

G. Sequence for Pressure Testing:

1. If an isolation valve is used to isolate a segment of pipe for pressure testing, the piping on both sides of the valve shall be installed with backfill and compaction fully completed on both sides of the valve for a minimum distance of 250-feet.

3.03 SCHEDULE

A. The waterline shall be constructed using any combination of the following pipe materials, unless noted otherwise in the Contract Documents for specific areas:

1. PVC Pipe:
   a. 8-inch C900, Pressure Class 235, DR 18.
2. Ductile Iron Pipe (DIP):
   a. 12-inch and smaller: Pressure Class 350.
3. HDPE Pipe:
   a. 2-inch HDPE: Pressure Class 250, DR 9.
   b. 6-feet HDPE for horizontal directional drilling: Pressure Class 200, DR 11.

B. Buried Ductile Iron Piping, Fittings, and All External Restraint Assemblies; and Buried Metal Valves and All Metal Appurtenances: Install with polyethylene encasement.

END OF SECTION

SECTION 33 12 33.01

WATER METERS AND AUTOMATED METER READING SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and install residential and commercial service water meter assemblies, and automated meter read (AMR) system as shown on Drawings and specified herein.

B. All related accessories to the AMR system shall be manufactured by the meter manufacturer, if available, and furnished by the same supplier.

1.02 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples: Product data for water meters, meter boxes and meter setters and automated meter read (AMR) system.

B. Certification that all equipment complies with current Federal Communications Commission (FCC) requirements and equipment is properly labeled.

1.03 OPERATION AND MAINTENANCE DATA

A. Section 01 78 23 – Operation and Maintenance Data.

B. Manufacturer's complete operations and maintenance manuals for both meters and the Automated Meter Reading System, including the following items as a minimum.
1. Operating instructions.
2. Maintenance instructions.
3. Calibrating instructions.

1.04 QUALITY ASSURANCE

A. Products furnished by a manufacturer regularly engaged in design and manufacture of water meters and automated meter reading systems.

B. Manufacturer shall have at least 10 years' experience in the absolute encoder-based remote metering systems.

C. Manufacturer's authorized warranty repair station within 200 mile radius of installation; service station to have been appointed at least 2 years prior to the start of this project.

1.05 WARRANTY

A. In printed form and apply to all components.

B. Water Meters:

1.	Guaranteed free from defects in materials and workmanship	5 years
2.	AWWA C700 New Meter Accuracy Standards	5 years
3.	At expiration of new meter warranty:	
a.	AWWA Repaired Meter Accuracy Standards; 5/8″ to 1″	5-10 years
b.	AWWA Repaired Meter Accuracy Standards; 1-1/2″ to 2″	5-10 years
4.	Electronic Registers guaranteed from defects in materials and workmanship	5 years
5.	Remote ScanPads (wall and pit mounted) guaranteed from defects in material and workmanship	5 years

C. Electronic Encoder Registers:

1.	Guaranteed free from defects in materials and workmanship	5 years
2.	Registers and pads perform accurately:	
a.	Radio Read Meters:	
1)	Plastic Lens Encoder	10 years
2)	Glass Lens Encoder	10 years
3)	Pads	10 years

PART 2 PRODUCTS

2.01 WATER METERS

A. Size as shown on Drawings or scheduled.

B. Accuracy Requirements: Meet or exceed AWWA C700 meter accuracy standards.

C. Meter:
1. Electronic Encoder Register.
2. Radio Read Pad.
3. AWWA C 700.
4. Or Engineer reviewed equivalent.

D. Appurtenances: Each meter supplied and installed with cast iron cover (Ford W-3) with RadioRead Pad mounts.
1. Each meter supplied and installed with new H-20 rated cover with RadioRead Pad mounts.
2. Setter equivalent to Ford VHH-72, Serial W with dual check valve, if required.
3. Other installation appurtenances and accessories as shown on Drawings.

2.02 SPARE PARTS

A. Deliver to Owner the following spare parts:
1. Ten spare meters with Electronic Communication Registers.
2. Ten Meter Transceiver Wires.
3. One splice kit (including wire, insulators and tools for ten splice) for wiring inside meter pits.

PART 3 EXECUTION

3.01 INSTALLATION

A. Meters installed in existing meter pits or new meter pits; see Drawings.

B. In accordance with manufacturer's directions.

3.02 REQUIRED SUPPORT BY FIELD SERVICE REPRESENTATIVE

A. See Section 01 75 01 – Field Service Representative, for qualifications of Field Service Representative.

B. Present to check installation and operation.

C. Provide 24-hours of training to Owner's personnel on operating the AMR system including:
   1. AMR system Hardware.
   2. AMR system Software.

D. Operation and maintenance per requirements of Section 01 78 23 – Operation and Maintenance Data, apply.

3.03 SCHEDULE

A. Number of Meters: As scheduled on Bid Form.

B. Size of Meters: As shown on Drawings.

END OF SECTION

SECTION 33 13 13

DISINFECTION OF DOMESTIC WATER SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide personnel, equipment, and supplies, disinfect and test all potable water systems, including water treatment systems, waterlines, water storage reservoirs, water wells, and new building system including flushing at completion of treatment.

1.02 RELATED REQUIREMENTS

A. American Waterworks Association Standards:
   1. AWWA B100 – Granular Filter Material
   2. AWWA B300 – Hypochlorites
   3. AWWA C651 – Disinfection Water Mains
   4. AWWA C652 – Disinfection of Water Storage Facilities
   5. AWWA C654 – Disinfection of Wells
   6. AWWA C655 – Field Dechlorination

1.03 RELATED WORK

A. National Sanitation Foundation International (NSF):
   1. NSF/ANSI 60 – Drinking Water Treatment Chemicals – Health Effects.

1.04 QUALITY ASSURANCE

A. Regulatory Agency Requirements: Comply with applicable state requirements.

1.05 SUBMITTALS

A. Disinfection Plan:
   1. Submittal Requirements:
      a. Prior to filling water system with water, submit electronic file of Disinfection Plan to Engineer for review and comment. Flushing, disinfection and sampling procedures shall be in accordance with the referenced AWWA standards.
      b. Address Engineer's comments and submit electronic file of Final Disinfection Plan to Engineer and NMED Drinking Water Bureau pursuant to NMAC 20.7.10.201 B.(3), NMAC 20.7.10.201 T.(2) and NMAC 20.7.10.400 F.
      c. Do not fill system with water until NMED has approved the plan.
      d. After disinfection has been completed, submit a signed and notarized affidavit to the Engineer and NMED Drinking Water Bureau confirming

that disinfection procedures have been completed according to the referenced AWWA standards.

2. Proposed Actions Described in Plan:
   a. How pipes and tanks will be filled with source water. Coordinate availability of water with Owner.
   b. Identify the sequence of filling system, chlorinating water, pressure testing and flushing system. Follow procedures specified in the referenced AWWA disinfection standards. Reference which AWWA method of chlorination will be followed.
   c. If system will be disinfected, tested and flushed in segments, identify where and in what sequence the segments will be isolated and tested. Be aware that elevation differences may require breaking up a pipeline into segments with no more than approximately 50 psi (115 vertical feet) pressure difference within the segment.
   d. Identify points in the system where water will be introduced, chlorine added (or swabbed), initial and residual chlorine concentrations measured, flushing water blown off, final chlorine residuals measured after flushing, and bacteriological sample points.
   e. Identify method of measuring chlorine residual in the field.
   f. Identify the bacteriological test lab that will be used, test method, and sampling, chain of custody, and transportation procedures.
   g. Describe how highly chlorinated flush water will be properly disposed.

B. Test Reports: Submit two copies as follows:
   1. Disinfection Report, Include:
      a. Date issued.
      b. Project name and location.
      c. Treatment contractor's name, address, and phone number.
      d. Type and form of disinfectant used.
      e. Time and date of disinfectant injection start.
      f. Time and date of disinfectant injection completion.
      g. Test locations.
      h. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
      i. Time and date of flushing start.
      j. Time and date of flushing completion.
      k. Disinfectant residual after flushing in ppm for each outlet tested.
   2. Bacteriological Report, Include:
      a. Date issued.
      b. Project name and location.
      c. Laboratory's name, certification number, address, and phone number.
      d. Time and date of water sample collection.
      e. Name of person collecting samples.
      f. Test locations.
      g. Time and date of laboratory test start.
      h. Coliform bacteria test results for each outlet tested.

i. Certification that water conforms or fails to conform to bacterial standards of Federal Safe Drinking Water Act.
j. Microbiologist's signature.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect against damage and contamination.

B. Maintain caution labels on hazardous materials.

C. Maintain storage room dry and with temperatures as uniform as possible between 60°F (15.6°C) and 80°F (26.7°C).

1.07 PROTECTION

A. Provide necessary signs, barricades, and notices to prevent any person from accidentally consuming water or disturbing system being treated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Disinfectant:
1. Free chlorine; liquid, powder, tablet or gas: Per AWWA B300.
2. Certified compliant with NSF/ANSI Standard 60.

PART 3 EXECUTION

3.01 INSPECTION

A. Prior to starting Work verify that domestic water system is completed and cleaned.

B. Do not start Work until conditions are satisfactory.

3.02 SYSTEM TREATMENT

A. Water Distribution and Transmission System: Per AWWA C651. Including disinfecting existing systems after repair.

B. Water Storage Reservoir: Per AWWA C652.

C. Water Wells: Per AWWA A100 and AWWA C654.

D. New Building Water System: Per local or State Plumbing Code.

E. Granular Media Filters: Per AWWA, B100.

F. Field Dechlorination: Per AWWA C655.

3.03 BACTERIOLOGICAL TEST

A. Take samples where and when as required by referenced standards or codes.

B. Analyze water samples in accordance with “Standard Methods for the Examination of Water and Wastewater”, latest edition, published by American Water Works Association.

C. Analyze water samples as otherwise required or allowed by referenced standards or codes.

D. Employ the services of an independent test laboratory certified by the New Mexico Environment Department Drinking Water Bureau to perform all bacteriological testing.

E. Payment for bacteriological testing for all other domestic water systems is considered incidental Work to the Contract Documents’ Bid Items.

3.04 DISPOSAL OF HEAVILY CHLORINATED WATER

A. Test heavily chlorinated water for chlorine residual in accordance with Appendix A of the AWWA C651.

B. Chlorine residual of water being disposed of, shall be neutralized in accordance with AWWA C655 – Field Dechlorination to meet residual acceptable for domestic use.

C. Dispose of water flushed from water main, after neutralization to designated receiving drainage. Coordinate with Engineer.

3.05 FAILURE OF DISINFECTION AND/OR BACTERIOLOGICAL TESTS

A. If test results do not comply with criteria required by referenced standards or codes, system shall undergo re-disinfection in accordance with Section 5.2 of the AWWA C651.

END OF SECTION

CERTIFICATION OF DISINFECTION
OF WATER FACILITIES

I, _____, hereby certify that the facilities constructed under the project _____ were disinfected in accordance with the Disinfection Plan submitted under Specification Section 33 13 13 – Disinfection of Domestic Water Systems and with the following American Water Works Association (AWWA) standards:

C651 – AWWA Standard for Disinfecting Water Mains
C652 – AWWA Standard for Disinfection of Water-Storage Facilities
C653 – AWWA Standard for Disinfection of Water Treatment Plants
C654 – AWWA Standard for Disinfection of Wells

Contractor: _____

Signature: _____

Printed Name: _____

Title: _____

Date: _____

Notary Certification:

State of _____

(County) of _____

Signed or attested before me on _____ by _____

SEAL

_____
Notary Public

My Commission Expires:_____

SECTION 40 27 02.09

MISCELLANEOUS VALVES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and install all miscellaneous valves specified herein.

1.02 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples: Product data for all items listed in PART 2 PRODUCTS, except for hose bibbs and plug cocks.

B. Section 01 78 23 – Operation and Maintenance Data: Operation and Maintenance Manuals for all items listed in Part 2 PRODUCTS, except for hose bibbs, plug cocks, stop gates, gate valves under 4 inches, and elastomeric check valves.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Same manufacturer for each type of valve throughout where practical.

B. Manufacturer's name or initials and working pressure ratings cast on valve body.

2.02 DESIGN REQUIREMENTS

A. General: Unless otherwise indicated, use valves suitable for 125 minimum psi WOG and 150°F.

B. Lead Free: All materials in contact with potable water shall be lead-free, as certified by the Water Quality Association to comply with NSF/ANSI 372, and shall be NSF 61 compliant.

C. Air/Vacuum and Air Release Valves:
1. Water Service Air Valves:
a. Functions - furnish type and size of water service air valves as scheduled or as noted on Drawings:
1) Air Release Valves: Releases air pockets during system operation.
2) Air/Vacuum Valves: Exhausts large quantities of air at system start-up, and introduces air to protect system from vacuum.
3) Combination Air Valves (CAV): Releases air pockets during system operation, exhausts large quantities of air at system start-up, and introduces air to protect system from vacuum.
b. Conformance: AWWA C512, NSF/ANSI 61 certified for drinking water, and NSF/ANSI 372 certified lead-free by WQA.

c. Pressure Rating: 150 psi, unless otherwise scheduled or shown on Drawings.
d. Body, Cover, and Baffle: Cast iron or ductile iron.
e. Interior and Exterior Coating: Fusion bonded epoxy in accordance with AWWA C550.
f. Float and Trim: Type 316 stainless steel.
g. Seat: Buna-N or Viton.
h. 2-inch Inlet and Smaller: NPT threaded inlet and outlet.
i. 3-inch and 4-Inch Inlet: NPT or 125 lb. pattern flange inlet, NPT outlet, as indicated on Drawings.
j. 6-inch and 8-Inch Inlet: 125 lb. pattern flange inlet, NPT outlet.
k. Piping Appurtenances: Inlet stainless steel ball or gate valve and vent return leg piping with 1/4-inch mesh stainless steel bug screen fastened to outlet, unless shown otherwise on Drawings.
l. Drain Valve Inspection Piping: Install stainless steel ball valve and stainless steel fittings on air valve body lower drain tap in accordance with manufacturer's Operation and Maintenance Manual to facilitate performance testing.

2. Vent Inflow Preventer (Provide where scheduled or shown on Drawings):
a. Construction: Dual in-line float check chambers.
b. Conformance: NSF/ANSI 372 certified lead-free by WQA; ASSE approved.
c. Chamber Bodies: Ductile iron, ASTM A536, grade 65-45-12, with test port in each chamber.
d. Interior and Exterior Body Coating: NSF 61 approved fusion bonded epoxy.
e. Check Floats: Type 316 stainless steel floats and trim.
f. Check Seat: Resilient, EPDM with fiberglass reinforcement, precision molded with raised O-ring surfaces or ridges to provide tight shutoff at 12 inches of water column.
g. Basket Screen: Type 304 stainless steel, sized with three times flow area of inlet, bayonet mounting.
h. Location: Piped to air valve vent.
i. Capacity: Sized to match full air flow capacity of air valve.
j. Installation: Provide wall bracket and stainless steel struts and hardware mounted to wall of vault.
k. Acceptable Manufacturers: Val-Matic FloodSafe ®, or Engineer reviewed equivalent.
l. Test Kit and Testing: Deliver to Owner one field test kit available from the manufacturer consisting of test cocks, clear test pipe, and expandable plug. Test each inflow preventer to the satisfaction of the Engineer and Owner.

3. Training of Owner's Personnel: Manufacturer's Field Service Representative shall provide 4 hours of training to Owner's personnel on operation and maintenance in accordance with the requirements of Section 01 79 01 – Manufacturer's Instruction of Owner's Personnel.

4. Insulation Blanket for Valves and Piping Inside Air Valve Stations:
   a. Service: Flexible, removable insulation blanket around valves and piping located inside buried air valve manholes.
   b. Outer and Inner Jackets: 17.0 oz./sq. yd. silicone impregnated fiberglass cloth.
   c. Insulation:
      1) Material: Fiberglass, 9 pcf density.
      2) Thermal Conductivity: k = 0.4 BTU/inch/hr/SF/F degree at 300ºF
      3) Thickness: 1-1/2 inches.
   d. Fabrication Requirements:
      1) Blanket construction shall be double-sewn lock stitch with a minimum of seven stitches per inch. Raw jacket edges shall have a tri-fold Silicone cloth binding. No raw-cut jacket edges shall be exposed. Stitching shall be done with Teflon-coated fiberglass thread.
      2) Blanket design shall encase the unit to be insulated.
      3) To maintain uniform thickness, stainless steel quilting pins shall be placed at random locations no greater than 18 inches apart. This will prevent shifting of the insulation fiber.
      4) Blanket insulation shall use a belt system fastening method: 1-inch wide webbed nylon belting with a 1-inch wide "D" ring fastener sewn onto the belt. The belts shall be left long enough to facilitate easy tightening. Heat the ends of the belts to prevent fraying.
      5) Fabricate blanket to enclose valves and valve handles.

D. Reduced Pressure Backflow Preventer:
1. Assembly shall consist of two independently operating, spring loaded, "Y" pattern check valves and one hydraulically dependent differential relief valve.
2. Automatically reduce the pressure in the zone between the check valves to at least 5 psi lower than inlet pressure.
3. Mainline valve body and caps including relief valve body and cover: Bronze.
4. Seat Discs: Nitrile, reversible.
5. Diaphragms: Fabric reinforced nitrile.
6. Springs: Stainless steel.
7. Diaphragm to seat area ratio: 10 to 1 minimum.
8. 175 psi water working pressure rating and water temperature range from 32ºF to 180ºF.
9. FEBCO Model LF825Y (up to 2 inches) or Engineer reviewed equivalent.
10. FEBCO Model LF860 (2 1/2 to 10 inches) or Engineer reviewed equivalent.
11. Conformance:
    a. AWWA C511 – Reduced Pressure Principal Backflow Prevention Assembly.
    b. Approved by the Foundation for Cross Connection Control and Hydraulic Research at USC.
    c. And listed in the American Society of Sanitary Engineering International (ASSE) "Prevention Rather Than Cure" Seal Authorization Booklet.
12. Furnish with air gap drain funnel and 1 inch Sch. 80 PVC drain piping to the nearest floor drain or through wall to daylight, unless shown otherwise on Drawings.

13. Shutoff Valves: Fully ported ball valves, integral with assembly.

2.03 PROTECTIVE COATING

A. Factory enamel paint unless specified otherwise.

PART 3 EXECUTION

3.01 INSTALLATION

A. Manufacturer's recommendations.

B. Per code or best trade or industry practice.

C. As indicated on Drawings.

3.02 SCHEDULE

A. As indicated on Drawings.

END OF SECTION

SECTION 40 27 02.10

VALVE BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Boxes for all buried, manually operated valves, and appurtenances.

B. Box covers with cast markings.

1.02 SUBMITTALS

A. Section 01 33 23: Shop Drawings, Product Data, and Samples. Product data for all items specified in PART 2 – PRODUCTS.

B. Section 01 78 23: Operation and Maintenance Manual for valve position indicators.

PART 2 PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

A. ASTM A48 Class 35 cast iron, adjustable screw extension type, traffic type.

B. Minimum thickness of metal at any point: 3/16″.

C. Coating: Asphaltic bituminous coating, inside and out, 1.5 mil minimum thickness.

D. Removable cast iron cover, 5-1/4″ diameter standard drop lid, cast marking with words, “WATER”, “SEWER”, “REUSE”, or “GAS” to match appropriate utility.

E. Cast iron base properly sized to fit over valve bonnet and bear on bricks, as shown on Drawings.
   1. Base shall be large enough to extend 6″ below bottom of valve operating nut.
   2. Base shall be large enough so no part of the base or its bearing bricks shall bear on any part of the valve.

F. For valves on washwater and irrigation system only: Class 200 PVC pipe.

G. All valve boxes for valves scheduled to be equipped with valve position indicators shall be designed for integral installation of the position indicator.

H. Valve Boxes Scheduled Without Position Indicators:
   1. Furnish valve stem extension to position standard AWWA 2″ operating nut within 3.5′ to 2.5′ below the lid.

I. Valve Position Indicators for Buried Gear-Operated Valves:
   1. All gearing in a waterproof sealed unit.
   2. Synchronized with the valve to match the valve's required number of turns from open to close.
   3. Furnished with cast iron adaptor where required to facilitate installation within the valve box body.
   4. Furnish with 2″ AWWA nut and 1 1/4″ steel rod extension riser and socket to attach to valve nut.
   5. Henry Pratt Diviner™, Cameron Dynatorque GPI-S, or Engineer reviewed equivalent.

J. Valve Position Indicator for Buried Direct-Drive Valves:
   1. Synchronized with the valve to match the valve's quarter turn travel from open to closed.
   2. Furnished with cast iron adaptor (riser) to facilitate installation within the valve box body.
   3. Indicator and adaptor specifically designed to allow removal of the indicator without requiring removal of the valve box adaptor.
   4. DeZurik indictor for quarter turn actuated valve or Engineer reviewed equivalent.
   5. Designs which require removal of the valve box adaptor casting in order to remove the position indictor are not acceptable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Per AWWA Manual M44: Distribution Valves: Selection, Installation, Field Testing, and Maintenance, Latest Edition.

B. With concrete collar, as shown on Drawings.

C. Shall not bear on pipe or valve.

3.02 SCHEDULE

A. Valve boxes for buried quarter turn valves 4″ or greater in size to include valve position indictors unless otherwise shown on Drawings.

END OF SECTION

APPENDIX A

GEOTECHNICAL ENGINEERING SERVICES REPORT

20,000 FOOT WATER TRANSMISSION LINE CAÑONCITO, NEW MEXICO

OCTOBER 9, 2013

GEOTECHNICAL INFORMATION

A geotechnical report was prepared specifically for this project by Geo-Test, Inc., dated October 9, 2013, entitled: Geotechnical Engineering Services Report – 20,000 Foot Water Transmission Line, Cañoncito, New Mexico, Job. No. 1-30812.

Contractor may rely upon the general accuracy of the "technical data" contained in the following geotechnical investigation report. Contractor may not rely upon or make a claim against the Owner, Engineer, or any of the Engineer's Consultants with respect to:

a. the completeness of such report for Contractor's purposes, including, but not limited to all of the construction criteria to be employed by Contractor during the construction process, or

b. other data, interpretations, opinions and information contained in the report, or

c. any Contractor interpretation of or conclusion drawn from any "technical data" or any such data interpretation, opinions or information.

GEO-TEST

GEOTECHNICAL ENGINEERING SERVICES JOB NO. 1-30812 20,000 FOOT WATER TRANSMISSION LINE CAÑONCITO, NEW MEXICO

PREPARED FOR

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GEO-TEST

October 9, 2013
Job No.1-30812

Molzen Corbin & Associates
2701 Miles Road SE
Albuquerque, New Mexico 87106

ATTN: **Mr. Douglas W. Albin, P.S.**

RE: **Geotechnical Engineering Services**
20,000 Foot Water Transmission Line
Cañoncito, New Mexico

Dear Mr. Albin:

Submitted herein is the Geotechnical Engineering Services Report for the above referenced project. The report contains the results of our field investigation, laboratory testing, and recommendations trench excavations, as well as criteria for the required earthwork.

It has been a pleasure to serve you on this project. If you should have any questions, please contact this office.

Respectfully submitted:

GEO-TEST, INC.

Robert D Booth, P.E.

ROBERT D. BOOTH
NEW MEXICO
5711
LICENSED PROFESSIONAL ENGINEER

Reviewed by:

Charles M. Miller, P.E.

cc: Addressee (3)

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INTRODUCTION

This report presents the results of the geotechnical engineering services investigation performed by this firm for the proposed 20,000' water transmission line to be constructed along various roadways in Cañoncito, New Mexico.

The objectives of this investigation were to:

1) Evaluate the nature and engineering properties of the subsurface soils and/or rock underlying selected areas along the proposed water line.

2) Provide information relative to the soils and/or rock profile along with our evaluations relative to the difficulty of excavation, allowable trench slopes, and criteria for the necessary earthwork.

The investigation includes subsurface exploration, selected soil sampling, laboratory testing of the samples, performing an engineering analysis and preparation of this report.

PROPOSED CONSTRUCTION

It is understood that the project will consist of the design and construction of 20,000 feet of new water transmission line along various roadways in Cañoncito, New Mexico.

Should project details vary significantly from those outlined above, this firm should be notified for review and possible revision of recommendations contained herein.

SUBSURFACE INVESTIGATION

A total of 10 exploratory borings were drilled at selected locations along the proposed alignment of the new waterline. The borings were drilled to depths ranging from approximately 6 feet to 16 feet below existing site grades. Locations of the borings are shown on the attached Boring Location Map, Figure 1. The soils and/or rock encountered in the borings were continuously examined, visually classified and logged during the drilling operation. The boring logs are presented in a following section of this report. Drilling was accomplished using a truck mounted drill rig equipped with 5-inch diameter continuous flight hollow stem auger. Subsurface materials were sampled at five foot intervals or less in the

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borings utilizing an open tube split barrel sampler driven by a standard penetration test hammer.

LABORATORY TESTING

Selected soil/rock samples were tested in the laboratory to determine certain engineering properties of the soils. Moisture contents were determined to evaluate the various deposits with depth. The results of these tests are shown on the boring logs.

Sieve analysis and Atterberg limits tests were performed to aid in classification. Results of these tests are shown on the Summary of Laboratory Results presented in a following section of this report.

SUBSURFACE SOIL CONDITIONS

As indicated by exploratory borings, the soils/rock underlying the proposed alignment of the water transmission line are relatively uniform, consisting predominantly of weathered shale bedrock with occasional areas interbedded with weathered sandstone bedrock. The shale bedrock was generally highly to moderately weathered forming sandy clay or clayey sand. These bedrock materials are generally soft to moderately hard geologically but are very firm to hard from an engineering point of view and refused the auger at several of the boring locations.

Moisture contents of these bedrock materials were generally low to moderate (slightly moist to moist) throughout the extent of the borings and no groundwater encountered in any of the borings.

CONCLUSIONS AND RECOMMENDATIONS

Analyses of Results

The results of this investigation indicate that most of the weathered shale bedrock materials encountered in the borings along the alignment of the waterline can be excavated without the use of blasting; however, difficult excavation should be anticipated and the use of heavy excavation equipment will probably be required. In general, the difficulty of excavation will increase as the depth of excavation increases. In addition, it is our opinion that the majority of the excavated shale bedrock materials will break down sufficiently during excavation such that they will be suitable for use as backfill above pipe embedment materials, although some processing to remove over sized particles may be necessary.

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Excavated slopes for the construction of the waterline trench should be designed and constructed in accordance with 29 CFR 1926, Subpart P, and any applicable state or local regulations. The contractor should be responsible for all temporary trench slopes excavated along the proposed waterline and design of any required temporary shoring, as applicable. In general, it appears that most of the trenching will be in materials that classify as bedrock, and thus, the trench excavations can be made with vertical side slopes. Shoring, bracing, and benching should be performed by the contractor in accordance with applicable safety standards. Spoil piles and heavy equipment should not be allowed within 5 feet of the top of the trench slopes.

Bedding and pipe embedment materials to be used around the water lines should be well graded sand or gravel conforming to the pipe manufacturer's recommendations and should be placed and compacted in accordance with project specifications, local requirements or governing jurisdiction. General fill to be used above pipe embedment materials should be placed and compacted in accordance with the plans and specifications. On-site soils may be used as general fill above pipe embedment materials provided they meet the requirements. Water jetting of trench backfill should not be allowed.

EARTHWORK

The following general guidelines should be included in the project construction specifications to provide a basis for quality control during earthwork operations. It is recommended backfill be placed and compacted under engineering observation and in accordance with the following:

1) After clearing and grubbing, and making the required trench excavations, all loosened or disturbed bedrock materials should be removed from the bottom of the trenches prior to placement of bedding materials.

2 However, some processing and the removal of oversized particles may be required. All backfill material should be free of vegetation and debris and contain no rocks larger than 4 inches.

3) Fill or backfill, should be placed in 8-inch loose lifts and compacted with approved compaction equipment. Each lift should be firm and non-yielding.

4) All compaction of fill or backfill should be accomplished to a minimum of 90 percent of the maximum dry density determined in accordance

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with ASTM D-698. The moisture content of the structural fill, during compaction, should be within 2 percent of the optimum moisture content.

5) Tests for degree of compaction should be determined by the ASTM D1556 method or ASTM D-6938. Observation and field tests should be carried on during fill and backfill placement by the geotechnical engineer to assist the contractor in obtaining the required degree of compaction. If less than 95 percent is indicated, additional compaction effort should be made with adjustment of the moisture content as necessary until 95 percent compaction is obtained.

FOUNDATION REVIEW AND INSPECTION

This report has been prepared to aid in the evaluation of the geotechnical profile at selected locations along the proposed water line to aid in the design of this project. It is recommended that the geotechnical engineer be provided the opportunity to review the final design drawings and specifications in order to determine whether the recommendations in this report are applicable to the final design. Review of the final design drawings and specifications should be noted in writing by the geotechnical engineer.

Variations from soil and ground water conditions presented herein may be encountered during construction of this project. In order to permit correlation between the conditions encountered during construction and to confirm recommendations presented herein, it is recommended that the geotechnical engineer be retained to perform sufficient review during construction of this project. Observation and testing should be performed during construction to confirm that suitable fill soils are placed upon competent materials and properly compacted.

CLOSURE

Our conclusions, recommendations and opinions presented herein are:

1) Based upon our evaluation and interpretation of the findings of the field and laboratory program.

2) Based upon an interpolation of soil conditions between and beyond the explorations.

3) Subject to confirmation of the conditions encountered during construction.

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4) Based upon the assumption that sufficient observation will be provided during construction.

5) Prepared in accordance with generally accepted professional geotechnical engineering principles and practice.

This report has been prepared for the sole use of Molzen Corbin & Associates, specifically for the design of proposed 20,000 foot water transmission line in Cañoncito, New Mexico, and not for the use by any third parties.

We make no other warranty, either express or implied. Any person using this report for bidding or construction purposes should perform such independent investigation as he deems necessary to satisfy himself as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project. If conditions are encountered during construction appear to be different than indicated by this report, this office should be notified.

All soil samples will be discarded 60 days after the date of this report unless we receive a specific request to retain the samples for a longer period of time.

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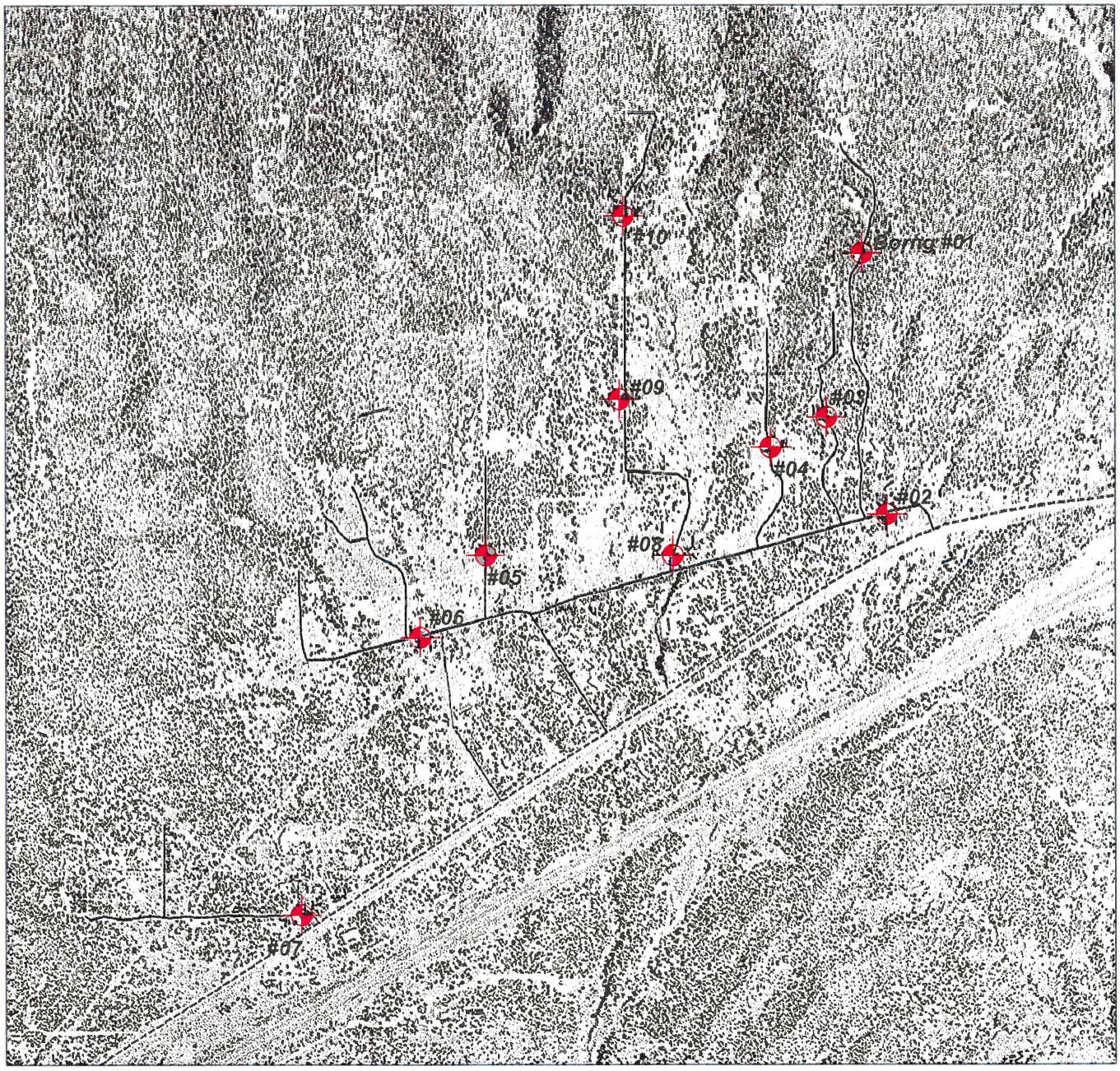
BORING LOCATION MAP



20,000 ' Water Transmission Line
Canoncito, New Mexico
Job No. 1-30812

FIGURE 1

GEO-TEST
GEOTECHNICAL ENGINEERING
AND MATERIAL TESTING
SANTA FE - ALBUQUERQUE - LAS CRUCES

GEO-TEST

Project: 20,000 Foot Water Transmission Line
Date: 09/17/2013 Project No: 1-30812
Elevation: Type: 5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 01

During Drilling: None After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	SUBSURFACE PROFILE DESCRIPTION	N blows/ft (20 40 60 80)
							BASE COURSE	4" Base Course	
		X	SS	9-21-21 42	10				42
5		X	SS	16-23-25 48	8				48
							SHALE	SHALE, highly weathered, forming Clayey Sand, medium plasticity, soft to moderately hard, moist, dark brown Note: Becmes moderately weathered with depth	
10		X	SS	25-50/6" 50/6"	10				
15		X	SS	13-26-28 54	12				54
								STOPPED AUGER AT 14.5' STOPPED SAMPPLER AT 16'	
20									

LOG OF TEST BORING 1-30812 CANONCITO.GPJ GEO TEST.GDT 10/9/13

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
UD - Undisturbed
ST - Shelby Tube

Stratification lines represent approximate boundaries between soil types. Transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurments were made.

GEO-TEST

Project: 20,000 Foot Water Transmission Line
Date: 09/17/2013 Project No: 1-30812
Elevation: Type: 5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 02

During Drilling: None After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	SUBSURFACE PROFILE DESCRIPTION	N blows/ft (20 40 60 80)
							BASE COURSE	3" Base Course	
		X	SS	5-8-23 31	8				•31
5		X	SS	40/5"	8				
							SHALE	SHALE, Highly to moderately weathered, forming Clayey Sand, soft to moderately hard, medium plasticity, moist, dark brown	
10		X	SS	36-50/3" 50/3"	8				
15		X	SS	50/5"	8				
								STOPPED AUGER AT 14.5' STOPPED SAMPLER 14' 11" *Boring caved to 8.5'	
20									

LOG OF TEST BORING 1-30812 CANONCITO.GPJ GEO TEST.GDT 10/9/13

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
UD - Undisturbed
ST - Shelby Tube

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GEO-TEST

Project: 20,000 Foot Water Transmission Line
Date: 09/17/2013 Project No: 1-30812
Elevation: Type: 5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 03

During Drilling: None After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	SUBSURFACE PROFILE DESCRIPTION	N blows/ft 20 40 60 80
		X	SS	50/3"	3		SHALE	SHALE, slightly to moderately weathered, forming Clayey Sand, low plasticity, moderately hard to hard, slightly moist, brown	
5		X	SS	50/5"	3				
								AUGER REFUSAL AT 6' SAMPLER REFUSAL AT 5'	
10									
15									
20									

LOG OF TEST BORING 1-30812 CANONCITO.GPJ GEO TEST.GDT 10/9/13

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
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ST - Shelby Tube

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GEO-TEST

Project: 20,000 Foot Water Transmission Line
Date: 09/17/2013 Project No: 1-30812
Elevation: Type: 5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 04

During Drilling: None After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	SUBSURFACE PROFILE DESCRIPTION	N blows/ft (20 40 60 80)
		X	SS	12-37-36 73	8				73
5		X	SS	26-34-39 73	7				73
							SHALE	SHALE, moderately weathered, forming Sandy Clay, medium to high plasticity, moderately hard, moist, dark brown	
10		X	SS	24-50/6" 50/6"	11				
15		X	SS	16-42-50/6" 50/6"	13				
								STOPPED AUGER AT 14.5' STOPPED SAMPLER AT 16'	
20									

LOG OF TEST BORING 1-30812 CANONCITO.GPJ GEO TEST.GDT 10/9/13

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
UD - Undisturbed
ST - Shelby Tube

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GEO-TEST

Project: 20,000 Foot Water Transmission Line
Date: 09/17/2013 Project No: 1-30812
Elevation: Type: 5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 05

During Drilling: None After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	SUBSURFACE PROFILE DESCRIPTION	N blows/ft (20 40 60 80)
		X	SS	9-13-24 37	14		SHALE	SHALE, highly to moderately weathered, forming Sandy Clay, medium to high plasticity, moderately hard, very moist, red/brown	37
5		X	SS	21-36-50/6" 50/6"	12				
10		X	SS	27-50/4" 50/4"	5		SHALE	SHALE, moderately weathered, interbedded with weathered Sandstone layers, moderately hard, low to medium plasticity, slightly moist, gray/brown	
15		X	SS	19-23-46 69	11		SHALE	SHALE, highly weathered, forming Sandy Clay, medium plasticity, soft to moderately hard, red/brown	69
								STOPPED AUGER AT 14.5' STOPPED SAMPLER AT 16'	
20									

LOG OF TEST BORING 1-30812 CANONCITO.GPJ GEO TEST.GDT 10/9/13

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
UD - Undisturbed
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GEO-TEST

Project: 20,000 Foot Water Transmission Line
Date: 09/17/2013 Project No: 1-30812
Elevation: Type: 5" OD HSA

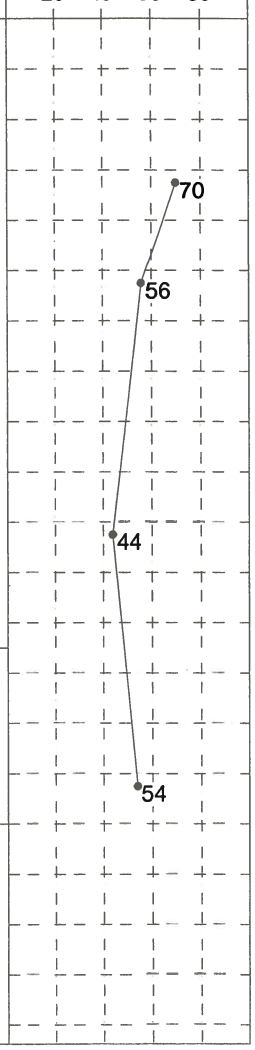
LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 06

During Drilling: None After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	SUBSURFACE PROFILE DESCRIPTION
		X	SS	16-31-39 70	9		SHALE	SHALE, highly weathered, forming Sandy Clay, medium plasticity, soft to moderately hard, moist, to slightly moist, brown
5		X	SS	15-25-31 56	7			
10		X	SS	11-21-23 44	10			
15		X	SS	18-26-28 54	2		SANDSTONE	SANDSTONE, highly weathered, non-plastic, moderately hard, moist, gray/brown
20								STOPPED AUGER AT 14.5' STOPPED SAMPLER AT 16' *Boring caved to 6.5'



LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
UD - Undisturbed
ST - Shelby Tube

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GEO-TEST

Project: 20,000 Foot Water Transmission Line
Date: 09/17/2013 Project No: 1-30812
Elevation: Type: 5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 07

During Drilling: None After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	SUBSURFACE PROFILE DESCRIPTION	N blows/ft (20 40 60 80)
		X	SS	8-12-18 30	16		CL	SANDY CLAY, medium to high plasticity, firm to very firm, moist, brown NOTE: Possibly highly weathered Shale	30
5		X	SS	11-12-12 24	15				24
								AUGER REFUSAL ON SHALE BEDROCK AT 7' SAMPLER REFUSAL ON SHALE AT 7'	
10									
15									
20									

LOG OF TEST BORING 1-30812 CANONCITO.GPJ GEO TEST.GDT 10/9/13

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
UD - Undisturbed
ST - Shelby Tube

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GEO-TEST

Project: 20,000 Foot Water Transmission Line
Date: 09/17/2013 Project No: 1-30812
Elevation: Type: 5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 08

During Drilling: None After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft (20 40 60 80)
							BASE COURSE	4" Base Course	
		X	SS	11-17-24 41	6		SHALE	SHALE, highly weathered, forming Clayey Sand, medium plasticity, soft to moderately hard, slightly moist to moist, brown	41
5		X	SS	30-30-38 68	7				68
10		X	SS	29-50/4" 50/4"	4		SANDSTONE	INTERBEDDED SANDSTONE AND SHALE, moderately weathered, medium plasticity, moderately hard, moist, brown	
15								AUGER REFUSAL ON BEDROCK AT 13' SAMPLER REFUSAL ON BEDROCK AT 10' 4"	
20									

LOG OF TEST BORING 1-30812 CANONCITO.GPJ GEO TEST.GDT 10/9/13

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
UD - Undisturbed
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GEO-TEST

Project: 20,000 Foot Water Transmission Line
Date: 09/17/2013 Project No: 1-30812
Elevation: Type: 5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 09

During Drilling: None After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	SUBSURFACE PROFILE DESCRIPTION	N blows/ft (20 40 60 80)
		X	SS	7-23-30 53	8		SANDSTONE	INTERBEDDED SANDSTONE AND SHALE, moderately weathered, medium plasticity, moderately hard, moist, brown	•53
5		X	SS	29-39-50/6" 50/6"	2				
10		X	SS	50/4"	9		SHALE	SHALE, slightly to moderately weathered, medium plasticity, moderately hard to hard, slightly moist to moist, brown	
15		X	SS	50/4"	7			STOPPED AUGER AT 14.5' STOPPED SAMPLER AT 14' 10"	
20									

LOG OF TEST BORING 1-30812 CANONCITO.GPJ GEO TEST.GDT 10/9/13

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
UD - Undisturbed
ST - Shelby Tube

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GEO-TEST

Project: 20,000 Foot Water Transmission Line
Date: 09/17/2013 Project No: 1-30812
Elevation: Type: 5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 10

During Drilling: None After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft (20 40 60 80)
		X	SS	25-30-36 66	7		SHALE	SHALE, moderately to slightly weathered, interbedded with occasional moderately weathered Sandstone layers, low to medium plasticity, soft to moderately hard, slightly moist, red/brown	•66
5		X	SS	50/5"	4				
10		X	SS	50/4"	7				
								BORING REFUSAL AT 11' SAMPLER REFUSAL AT 9'10"	
15									
20									

LOG OF TEST BORING 1-30812 CANONCITO.GPJ GEO TEST.GDT 10/9/13

LEGEND

SS - Split Spoon
AC - Auger Cuttings
UD/SL - Undisturbed Sleeve
AMSL - Above Mean Sea Level
CS - Continuous Sampler
UD - Undisturbed
ST - Shelby Tube

Stratification lines represent approximate boundaries between soil types. Transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurments were made.

SUMMARY OF LABORATORY RESULTS

						SIEVE ANALYSIS PERCENT PASSING											
TEST HOLE	DEPTH (FEET)	UNIFIED CLASS	(%) MOIST	LL	PI	NO 200	NO 100	NO 40	NO 10	NO 4	3/8"	1/2"	3/4"	1"	1 1/2"	2"	4"
01	2.5	SC	10.1	37	16	49	66	82	95	99	100						
01	4.5		7.6														
01	9.5		9.6														
01	14.5		11.6														
02	2.5		8.2														
02	4.5	SC	7.6	36	17	45	55	70	93	99	100						
02	9.5		7.6														
02	14.5		8.3														
03	2.5		3.4														
03	4.5	SC-SM	3.1	22	6	25	40	64	77	85	96	100					
04	2.5		8.2														
04	4.5		7.3														
04	9.5		10.5														
04	14.5	CL	13.4	48	24	60	74	89	94	98	99	100					
05	2.5		14.3														
05	4.5	CL	11.6	44	26	60	70	83	92	96	99	100					
05	9.5		4.5														
05	14.5		11.0														
06	2.5		9.3														

GEO-TEST

LL = LIQUID LIMIT
PI = PLASTICITY INDEX
NP = NON PLASTIC or NO VALUE

Project: 20,000 Water Transmission Line
Location: Canoncito, NM
Number: 1-30812

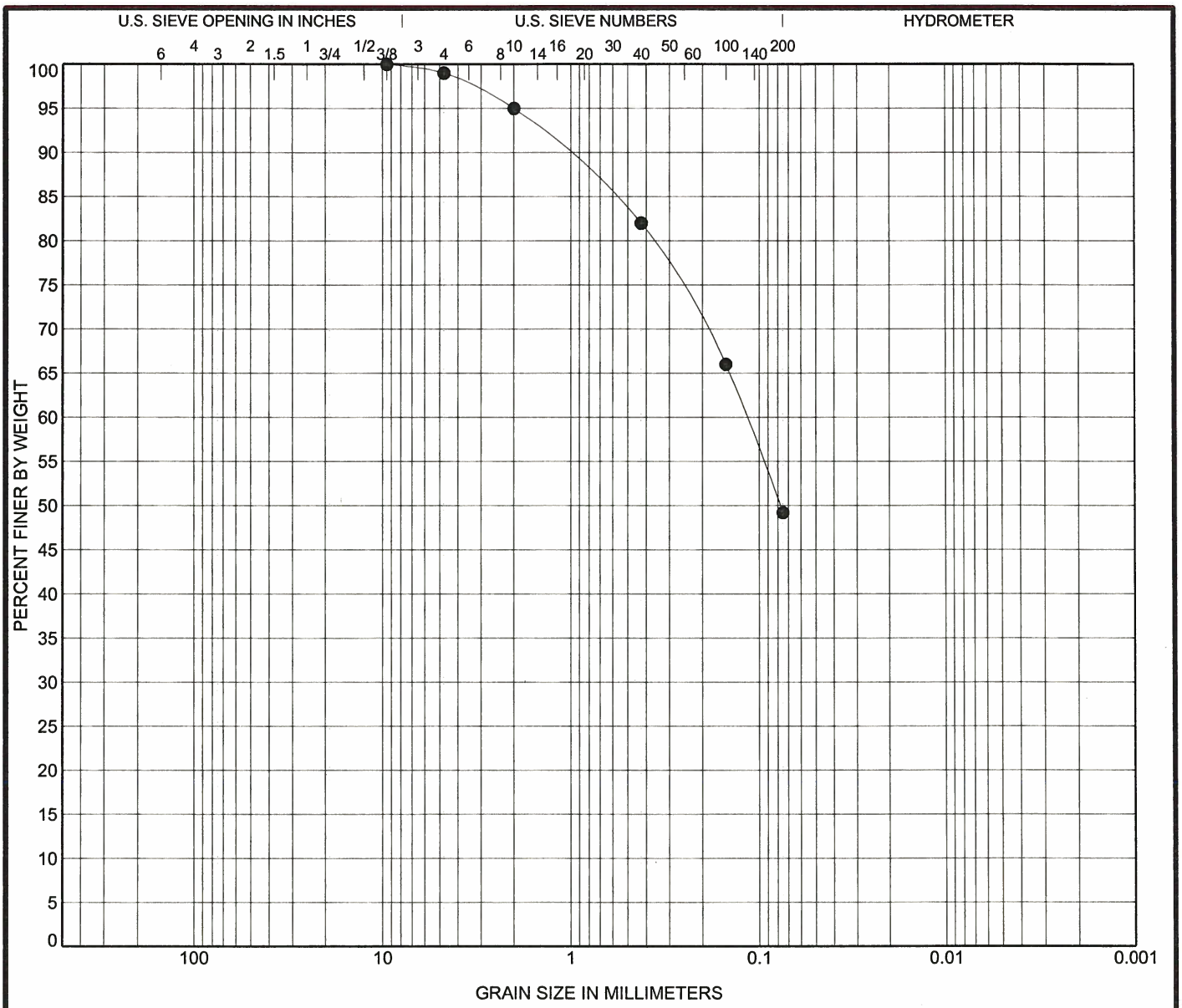
SUMMARY OF LABORATORY RESULTS

						SIEVE ANALYSIS PERCENT PASSING											
TEST HOLE	DEPTH (FEET)	UNIFIED CLASS	(%) MOIST	LL	PI	NO 200	NO 100	NO 40	NO 10	NO 4	3/8"	1/2"	3/4"	1"	1 1/2"	2"	4"
06	4.5	CL	7.2	36	19	51	60	73	91	98	100						
06	9.5		10.4														
06	14.5		1.5														
07	2.5		16.3														
07	4.5		14.6														
08	2.5	SC	5.6	29	11	33	44	58	72	78	82	82	89	100			
08	4.5		7.0														
08	9.5	SC	4.1	30	15	19	27	46	79	89	100						
09	2.5		8.0														
09	4.5		1.8														
09	9.5		8.5														
09	14.5		7.4														
10	2.5		6.5														
10	4.5	SC	3.9	29	11	22	28	41	60	71	83	92	100				
10	9.5		6.7														

GEO-TEST

LL = LIQUID LIMIT
PI = PLASTICITY INDEX
NP = NON PLASTIC or NO VALUE

Project: 20,000 Water Transmission Line
Location: Canoncito, NM
Number: 1-30812



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	01	2.5	**CLAYEY SAND(SC)**	**37**	**21**	**16**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	01	2.5	**9.5**	**0.117**			**1.0**	**49.8**	**49.2**	

GEO-TEST

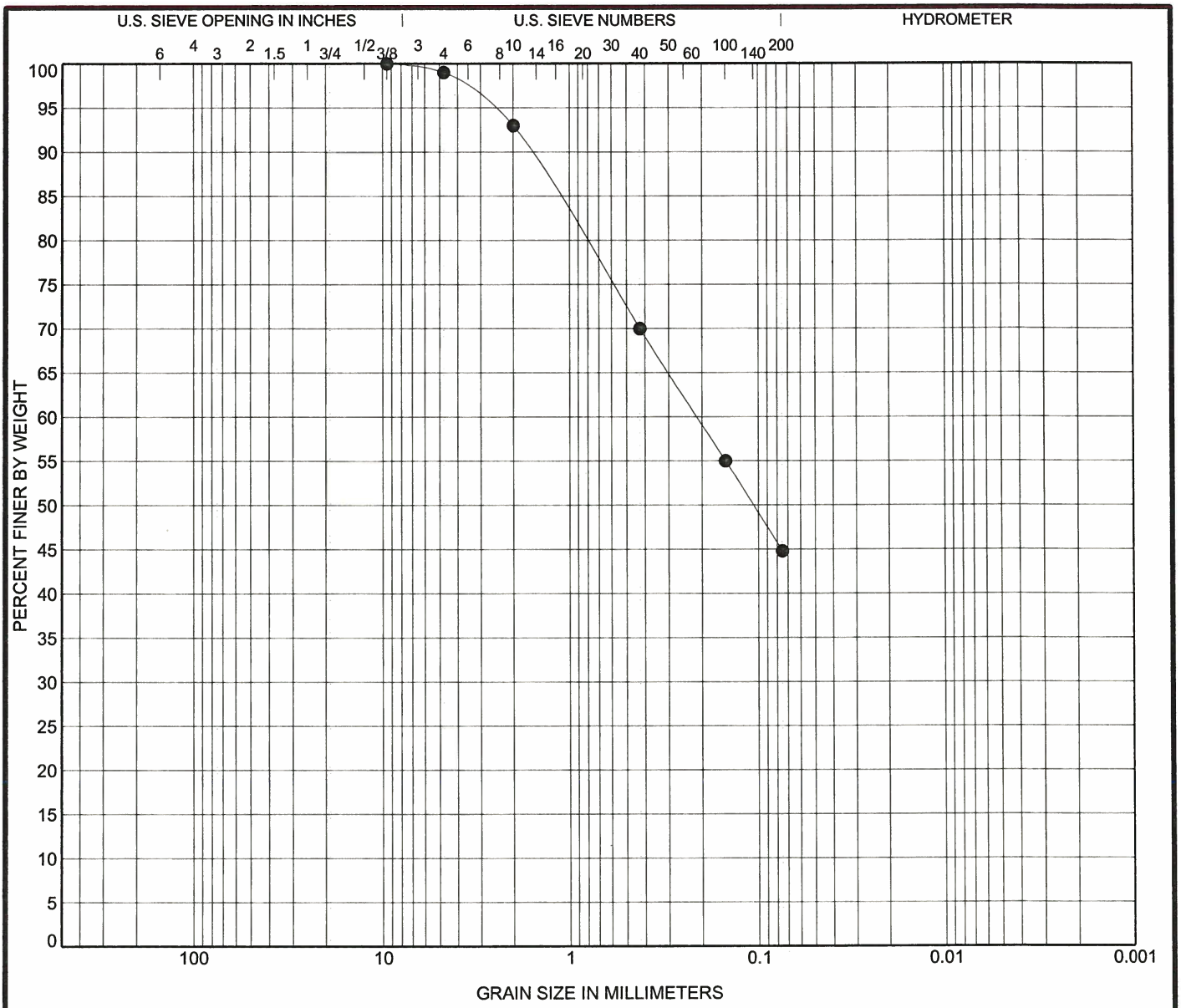
GRAIN SIZE DISTRIBUTION

Project: 20,000 Water Transmission Line

Location: Canoncito, NM

Number: 1-30812

US GRAIN SIZE 1-30812 CANONCITO.GPJ GEO TEST.GDT 9/24/13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	02	4.5	**CLAYEY SAND(SC)**	**36**	**19**	**17**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	02	4.5	**9.5**	**0.212**			**1.0**	**54.2**	**44.8**	

GEO-TEST

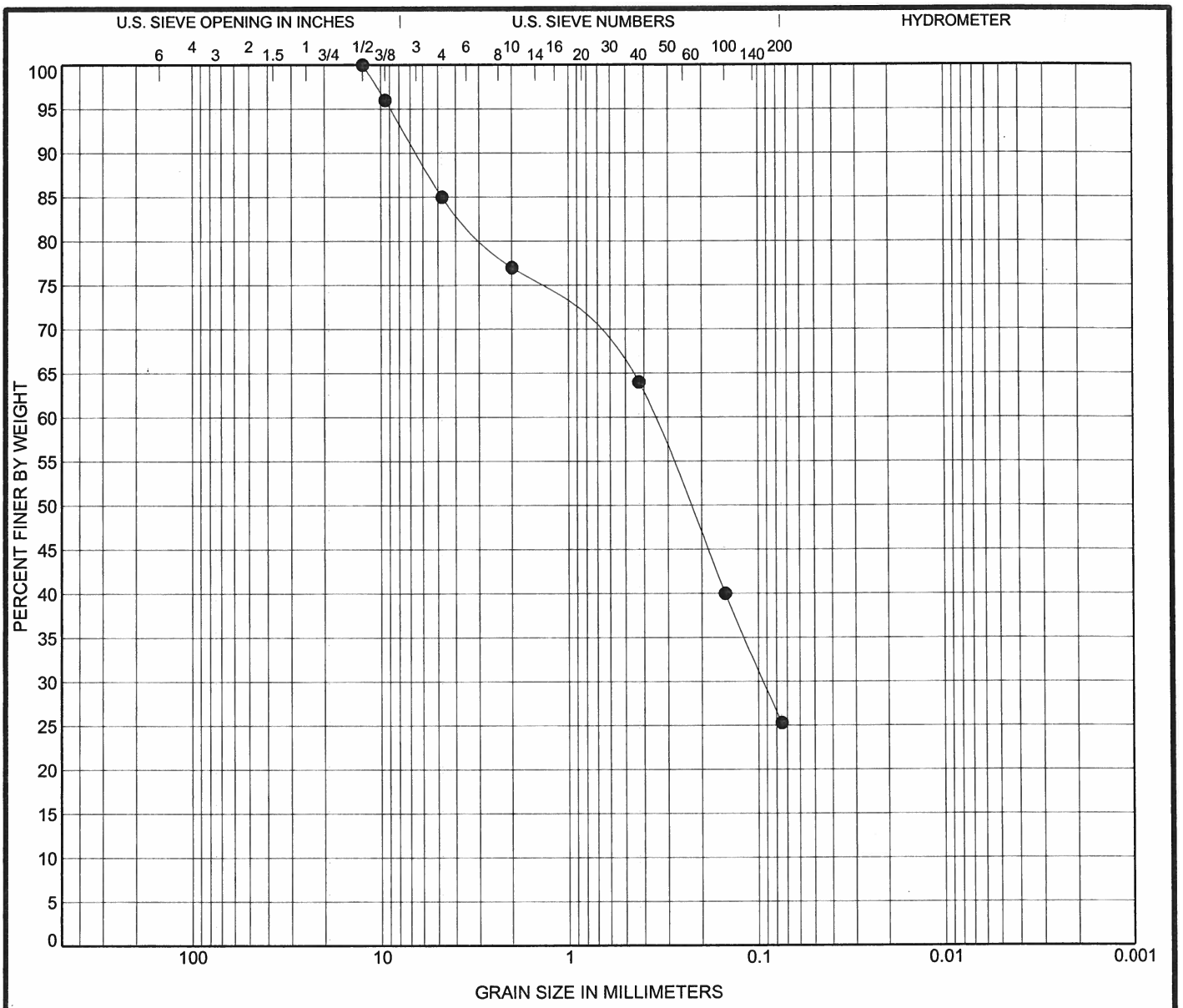
GRAIN SIZE DISTRIBUTION

Project: 20,000 Water Transmission Line

Location: Canoncito, NM

Number: 1-30812

US GRAIN SIZE 1-30812 CANONCITO.GPJ GEO TEST.GDT 9/24/13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	03	4.5	**SILTY, CLAYEY SAND with GRAVEL(SC-SM)**	**22**	**16**	**6**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	03	4.5	**12.5**	**0.357**	**0.094**		**15.0**	**59.7**	**25.3**	

GEO-TEST

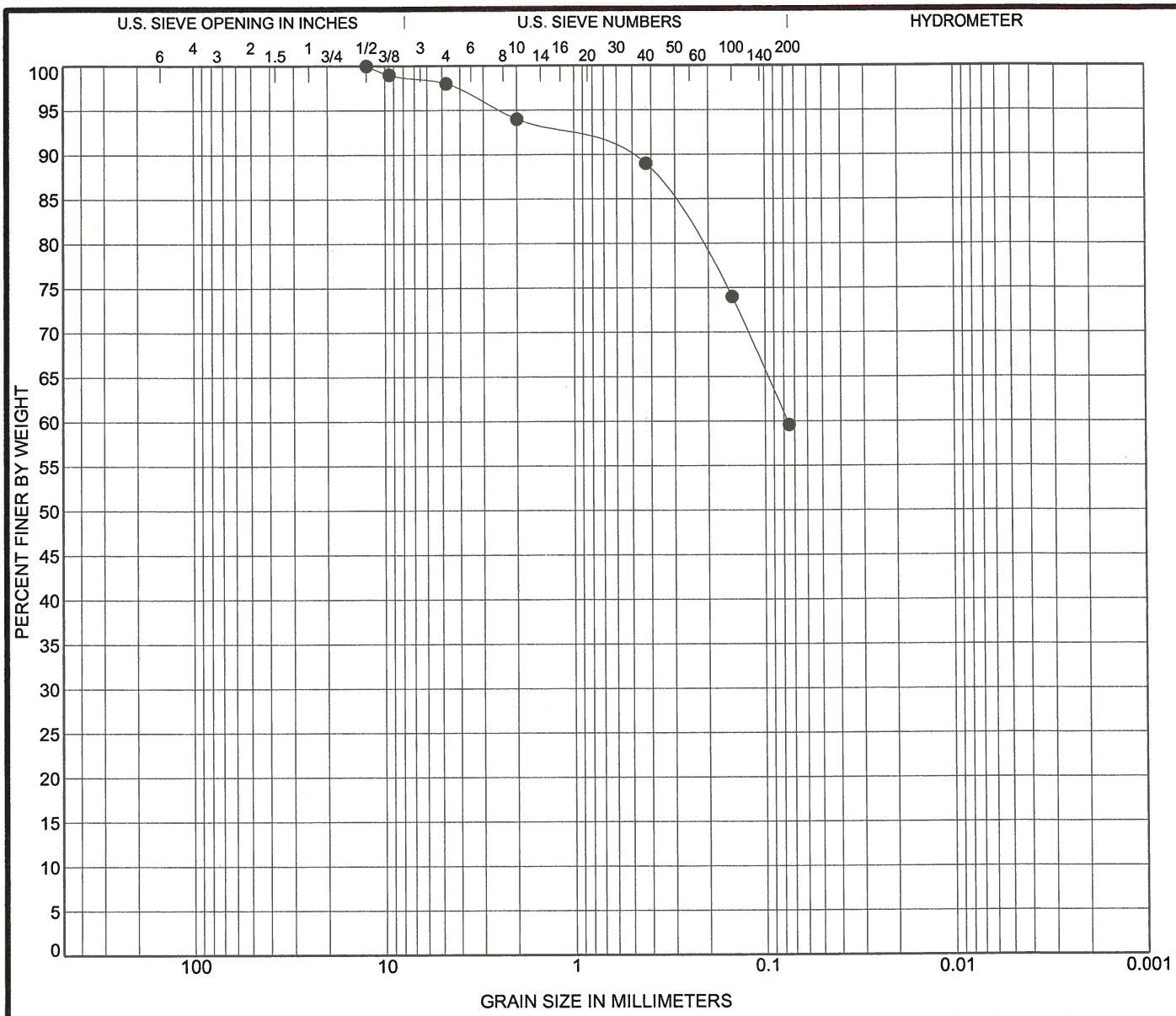
GRAIN SIZE DISTRIBUTION

Project: 20,000 Water Transmission Line

Location: Canoncito, NM

Number: 1-30812

US GRAIN SIZE 1-30812 CANONCITO.GPJ GEO TEST.GDT 9/24/13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	04	14.5	**SANDY LEAN CLAY(CL)**	**48**	**24**	**24**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	04	14.5	**12.5**	**0.076**			**2.0**	**38.4**	**59.6**	

GEO-TEST

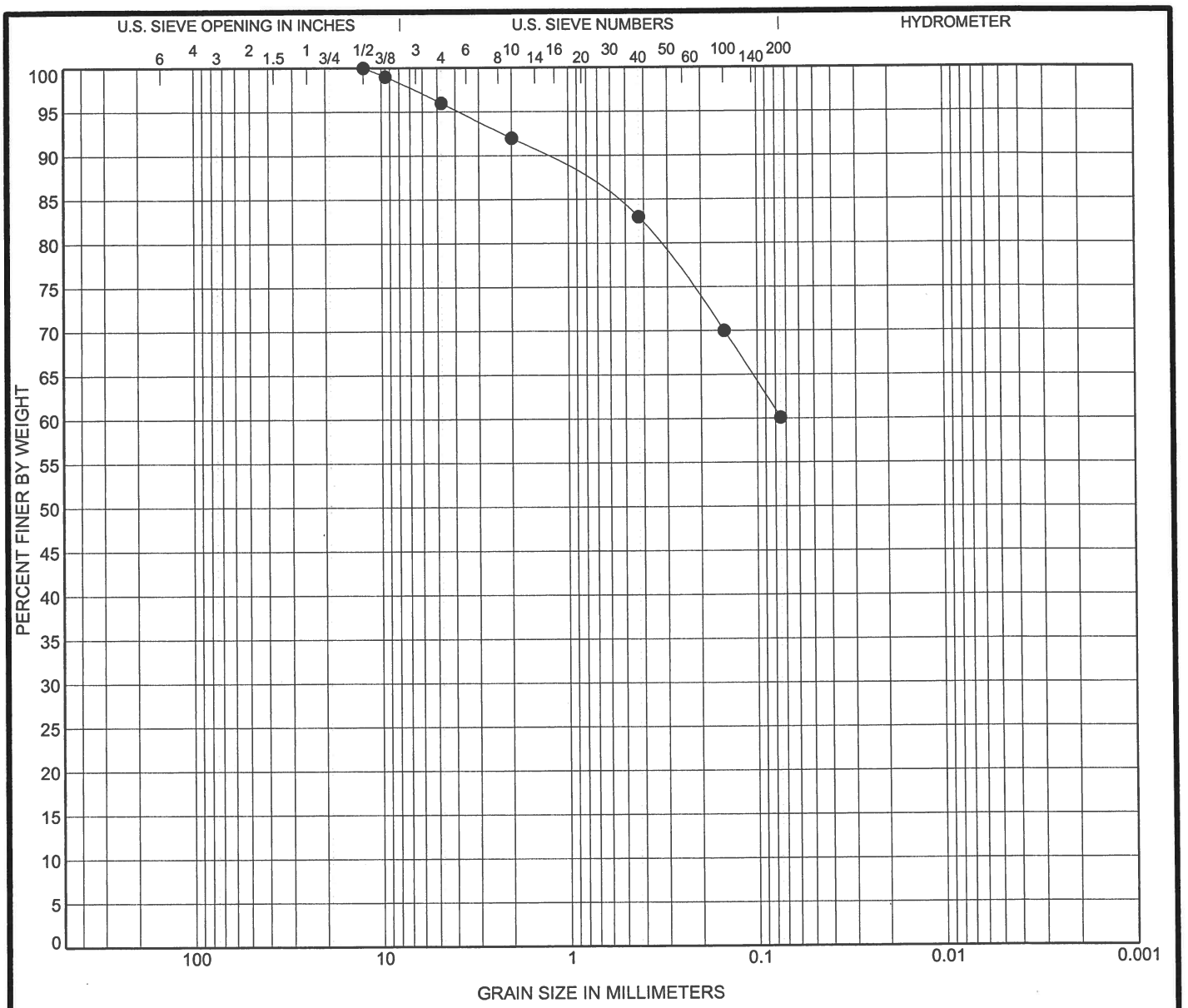
GRAIN SIZE DISTRIBUTION

Project: 20,000 Water Transmission Line

Location: Canoncito, NM

Number: 1-30812

US GRAIN SIZE 1-30812 CANONCITO.GPJ GEO TEST.GDT 9/24/13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	05	4.5	SANDY LEAN CLAY(CL)	44	18	26		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	05	4.5	12.5				4.0	35.9	60.1	

GEO-TEST

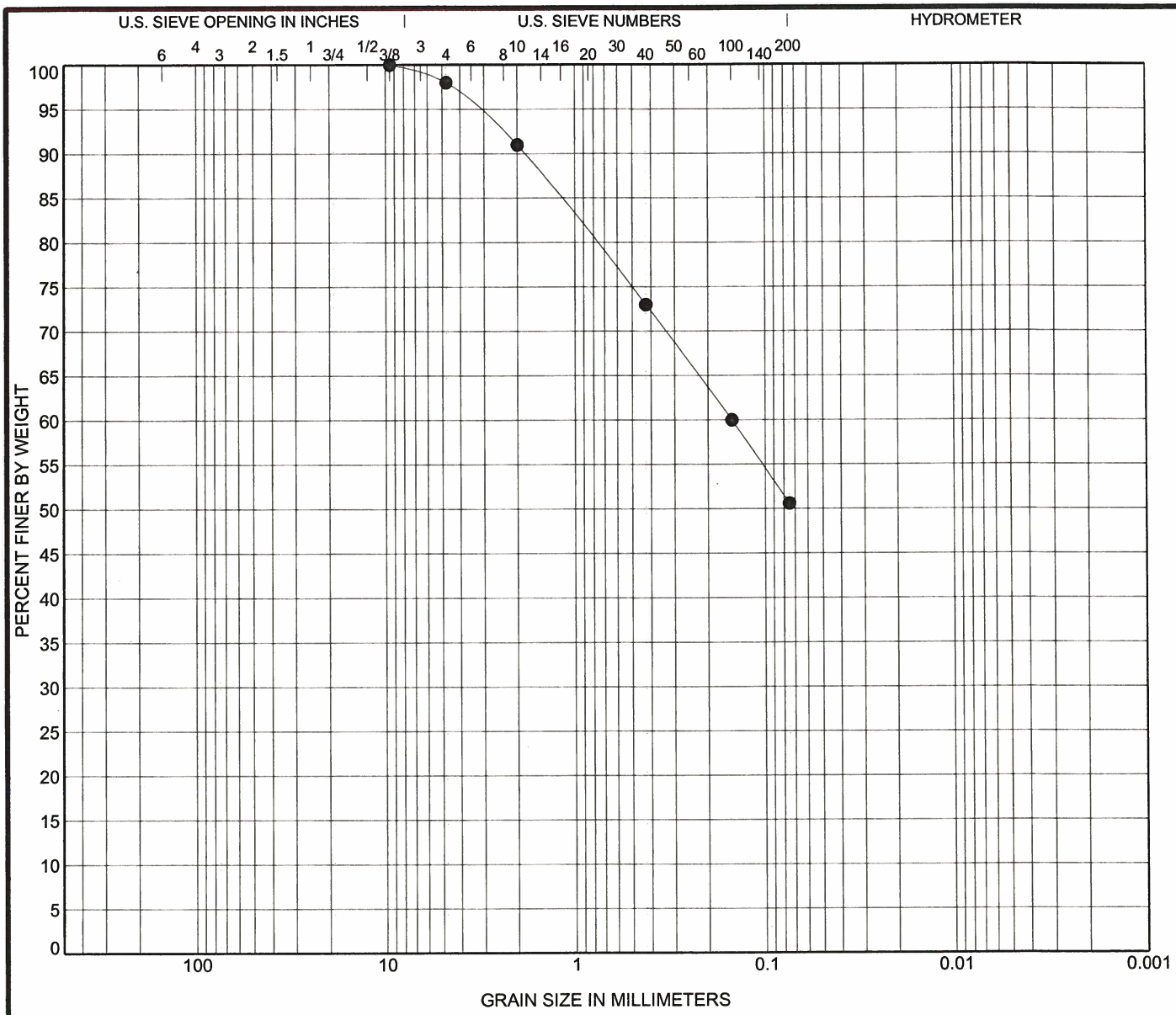
GRAIN SIZE DISTRIBUTION

Project: 20,000 Water Transmission Line

Location: Canoncito, NM

Number: 1-30812

US GRAIN SIZE 1-30812 CANONCITO.GPJ GEO TEST.GDT 9/24/13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	06	4.5	**SANDY LEAN CLAY(CL)**	**36**	**17**	**19**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	06	4.5	**9.5**	**0.15**			**2.0**	**47.4**	**50.6**	

GEO-TEST

GRAIN SIZE DISTRIBUTION

Project: 20,000 Water Transmission Line

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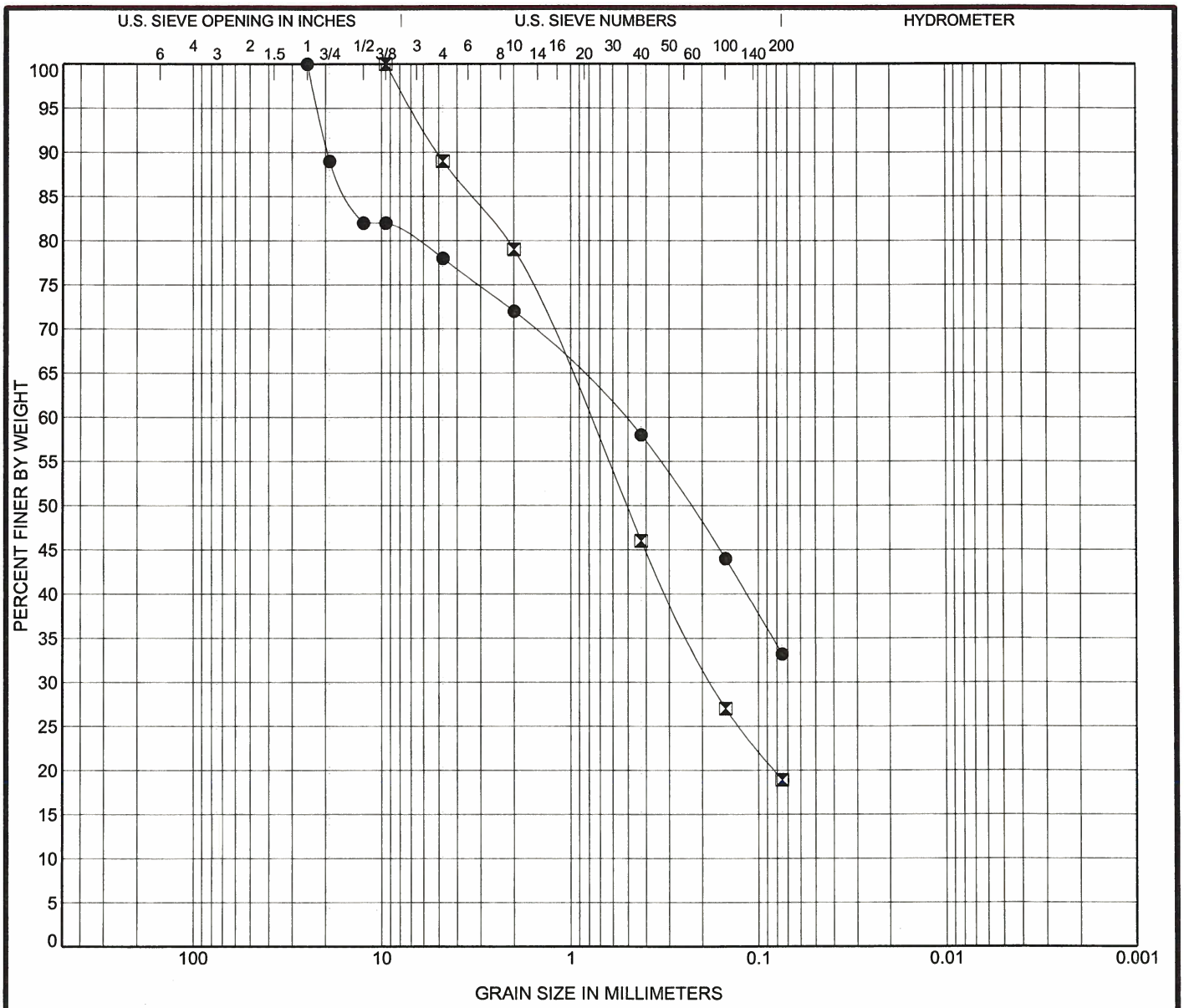
US GRAIN SIZE 1-30812 CANONCITO.GPJ GEO TEST.GDT 9/24/13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	08	2.5	**CLAYEY SAND with GRAVEL(SC)**	**29**	**18**	**11**		
⊠	08	9.5	**CLAYEY SAND(SC)**	**30**	**15**	**15**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	08	2.5	**25**	**0.53**			**22.0**	**44.8**	**33.2**	
⊠	08	9.5	**9.5**	**0.82**	**0.177**		**11.0**	**70.1**	**18.9**	

GEO-TEST

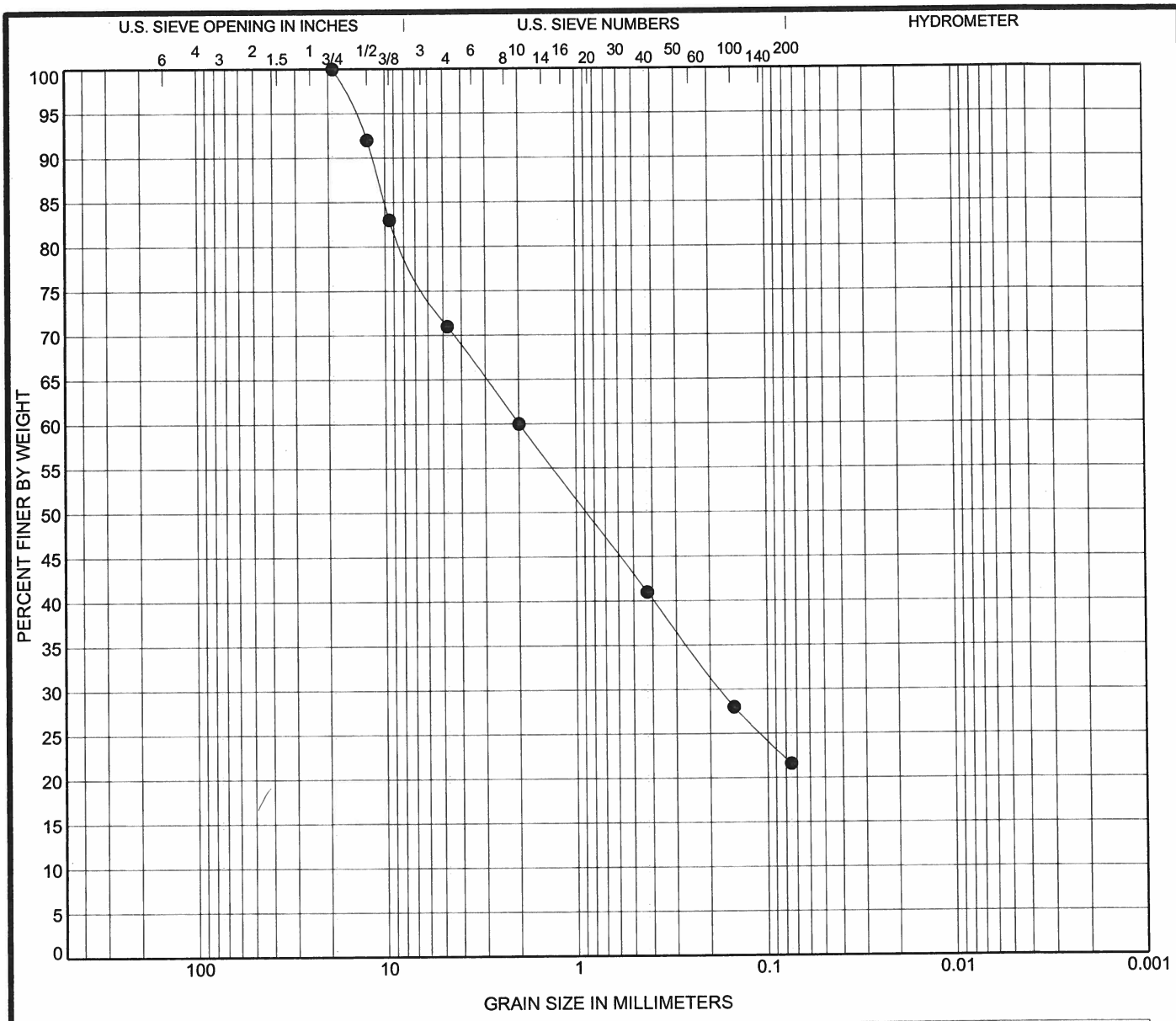
GRAIN SIZE DISTRIBUTION

Project: 20,000 Water Transmission Line

Location: Canoncito, NM

Number: 1-30812

US GRAIN SIZE 1-30812 CANONCITO.GPJ GEO TEST.GDT 9/24/13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	10	4.5	**CLAYEY SAND with GRAVEL(SC)**	29	18	11		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	10	4.5	19	2	0.176		29.0	49.4	21.6	

GEO-TEST

GRAIN SIZE DISTRIBUTION

Project: 20,000 Water Transmission Line

Location: Canoncito, NM

Number: 1-30812

US GRAIN SIZE 1-30812 CANONCITO.GPJ GEO TEST.GDT 9/24/13