

JOB # 4
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

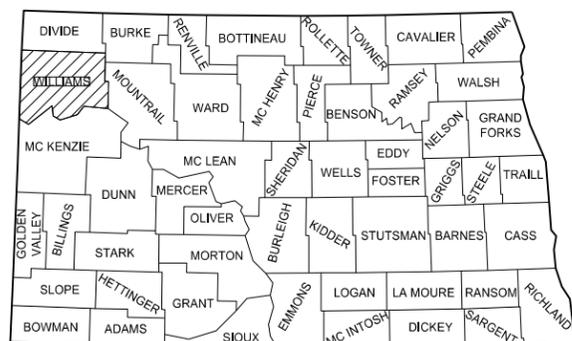
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| STATE | PROJECT NO. | PCN | SECTION NO. | SHEET NO. |
| ND | CPU-7-993(049)056 | 20928 | 1 | 1 |

CPU-7-993(049)056

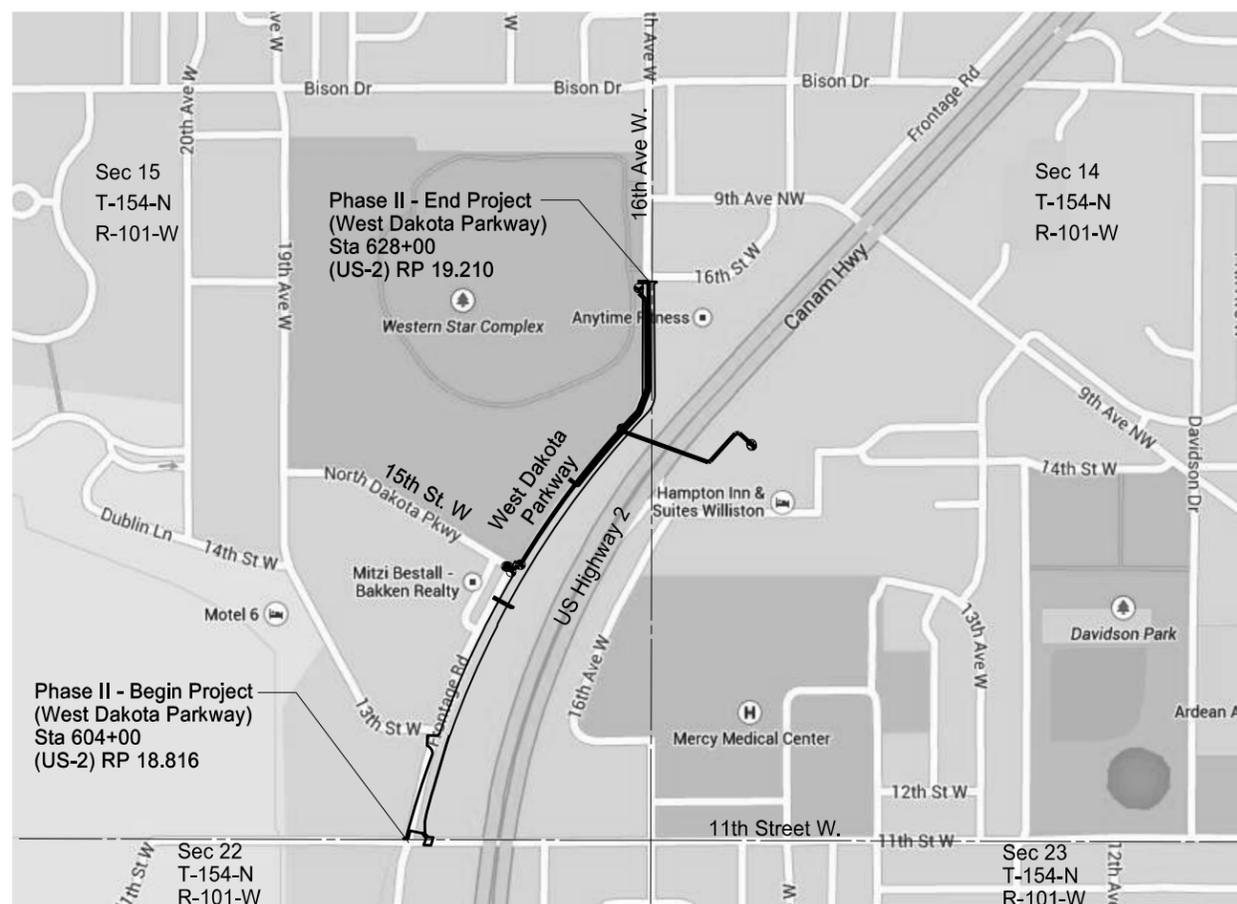
FHWA Limited Involvement
 Williams County
 City of Williston
 US Highway 2 and 11th Street Phase II (West Dakota Parkway)
 New Utilities

GOVERNING SPECIFICATIONS:
 Williston City Standard Specifications

| PROJECT NUMBER \ DESCRIPTION | NET MILES | GROSS MILES |
|--|-----------|-------------|
| CPU-7-993(049)056 West Dakota Parkway | 0.454 | 0.454 |



STATE COUNTY MAP



DESIGNERS

Daniel McRae

Greg Perkins

I hereby certify that the attached plans were prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the state of ND.

APPROVED DATE 5/29/2015

Kyle J. Comer /s/
 CIVIL SCIENCE, INC.

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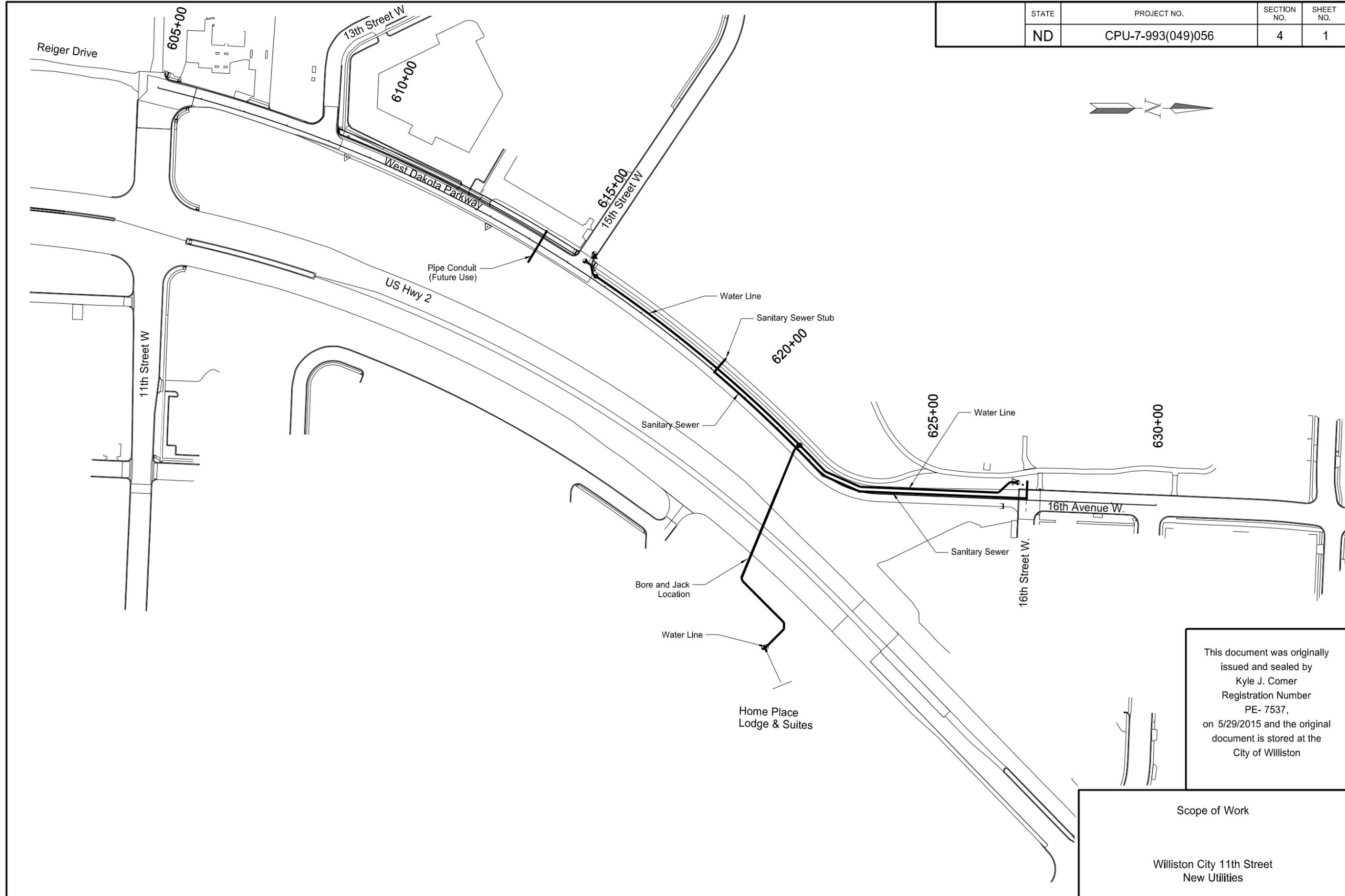
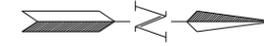
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Scope of Work
 Williston City 11th Street
 New Utilities

| | | | |
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NOTES

100-P01 NOISE ORDINANCE: No construction activities shall occur between the hours of ___10 P.M.____ to ___6 A.M.____. Construction during overnight hours will only be allowed as coordinated with and previously approved by the City of Williston. No overnight hours construction is to occur until the Contractor obtains written permission from the Engineer.

100-P02 TIED PROJECT: The subject project, Project No. CPU-7-993(049)056 US Highway 2 and 11th Street Phase II (West Dakota Parkway) New Utilities, is a tied project and shall be completed prior to the roadway construction of the tied project, Project No. SOIB-SOIA-7-002(154)018 US Highway 2 and 11th Street Phase II (West Dakota Parkway) HMA Reconstruction, Sidewalk, Storm Drains, Culvert Replacements, Culvert Extensions, Lighting, Pavement marking and Incidentals.

100-P03 DISRUPTION OF SERVICE: The contractor shall provide a general notice of any impending disruption of water service a maximum of two weeks and a minimum of one week prior to the anticipated disruption of service to all businesses and residences. The contractor must provide 24 hour notice to all businesses, water dependent operations and residences prior to scheduled disruption of services. Special notification may be required to water-dependent businesses. Special work hours may be required to be coordinated between the contractor, business owners, and Williston City. A maximum 8 hour shut-down period is allowed after receiving approval in writing from the Williston City Public Works Director.

100-P04 CONSTRUCTION LIMITS: The Contractor shall perform construction activities within the limits of the City property, identified easements, and boundaries of an approved NDDOT Utility Occupancy Application and Permit. Any damages to private properties shall be the responsibility of the Contractor to replace and restore to original conditions or the satisfaction of the Engineer and City. The City may assist in the general location of the right-of-way line upon formal written request by the Contractor.

Construction of the jack and bore waterline shall be done within the boundaries of an approved NDDOT Utility Occupancy Application and Permit and the waterline tie-in on the East side of US-2 shall stay within the existing 20 ft wide Utility Easement of Home Place Lodge & Suites as shown in the plan sheets.

100-P05 EXISTING UTILITY IMPACTS: The contractor shall avoid impacts to existing utilities where possible. Where impact to utilities are anticipated or encountered, coordinate related construction activities and required utility modifications with utility owners and the City of Williston Construction Representative. The contractor shall inform and coordinate

planned project construction with all utility owner's within project area prior to construction.

100-P06 EXISTING UTILITY LOCATIONS: Existing utility and sewer locations shown are based on existing records and field measurements. Prior to any excavation, the exact location of the utilities, as well as the existence and location of any other utilities not shown, shall be verified by the respective Utility Companies. The contractor shall pothole existing utilities to identify the exact location. Respective Utility Companies shall be informed by the contractor of potholing work and given the opportunity to be present throughout the potholing process.

100-P07 EXCAVATION AND TRENCH BOXES: Trench boxes shall be used for all work within trenches exceeding 4 feet in depth. Excavation for waterline and sanitary sewer is to follow OSHA Standard Number 1926 Subpart P.

261-P01 ENVIRONMENTAL CONTROLS: Environmental controls shall be paid as part of 702 0100 MOBILIZATION Bid Item. Environmental controls implemented by the subject project in accordance with the Storm Water Pollution Prevention Plan (SWPPP) shall be coordinated to function jointly with those environmental controls of the tied project, Project No. SOIB-SOIA-7-002(154)018 US Highway 2 and 11th Street Phase II (West Dakota Parkway) HMA Reconstruction, Sidewalk, Storm Drains, Culvert Replacements, Culvert Extensions, Lighting, Pavement Marking and Incidentals.

714-P01 JACK AND BORE PROCEDURES: Jack and bore procedures shall be compliant with the following:

A. DESCRIPTION

1. The Work of this Section includes all labor, machinery, construction equipment and appliances required to perform all jack and bore placement of pipeline casings and installation of pipe therein.
 - a. The overall work scope shall include, but not be limited to, jacking pits and equipment, sheeting, steel casing pipe, skid, spacers, steel straps, coatings, location signs as required, installation of the carrier pipe within the casings, miscellaneous appurtenances to complete the entire work as shown on the Construction Drawings, and restoration.
 - b. Jack and bore operations shall be performed within the right-of-way and/or

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- easements shown on the Construction Drawings.
2. The equipment used in jack and bore casings shall be of adequate commercial size and satisfactory working condition for safe operation, and may be subject to approval by the North Dakota Department of Transportation. Such approval, however, shall not relieve the Contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein. Only workmen experienced in jack and bore operations shall be used in performing the work.
 3. Provide all structures, safety equipment, and professional services required to provide for the health and safety of the general public and of personnel involved in pipe jack and bore work in accordance with the requirements of the regulatory agencies having jurisdiction.
 4. Take all measures necessary to protect surrounding public and private property, adjacent buildings, roads, drives, sidewalks, drains, sewers, utilities, trees, structures, and appurtenances from damage due to jack and bore pipe work. Responsibility and payment for correction of such damage, including additional engineering and/or inspection costs incurred by NDDOT and/or the City of Williston, shall be the sole responsibility of the Contractor.
 5. UTILITY OCCUPANCY APPLICATION AND PERMIT is typically required through the local NDDOT Williston District. Coordinate any permitting issues with the NDDOT Williston District Engineer Joel Wilt.
- B. REFERENCE DOCUMENTS
1. American Society for Testing and Materials (ASTM)
 2. American Water Works Associations (AWWA)
 3. American Welding Society (AWS)
 4. North Dakota Department of Transportation (NDDOT)
 5. City of Williston, North Dakota (City)
- C. SHOP DRAWINGS AND SUBMITTALS
1. Shop drawings and related manufacturer's product certification shall be made in accordance with the Specifications and Special Provisions of the Contract and the City of Williston Standard Specifications for approval prior to purchase or fabrication of the material by the manufacturer.
 2. Detailed drawings showing location/plan views of all jack and bore pits are required and to be submitted with the jack and bore plan (see note 4 this Section).
 3. Certification and test reports for the material, manufacturing, and test of the casing pipe shall be performed and furnished by the pipe manufacturer in accordance with the latest standards of the industry as referred to in Note 714-P02 Part A herein.
 4. For all installations, submit to the Engineer a jack and bore plan with sufficient information to establish the proposed installation strategy

- a minimum of 7 days prior to starting work. All plans shall be reviewed and approved by the Engineer prior to starting work. The plan shall include all the following information as applicable:
- a. An indication of where the leading edge of the casing is to be located with respect to the line and grade, and the intervals for checking line and grade during installation. Maintain a record of progress at the job site.
 - b. Equipment of adequate size and capability to install the product, and include the equipment manufacturer's information for all power equipment used in the installation.
 - c. The means for controlling line and grade.
 - d. The means for centering the cutting head inside the borehole.
 - e. Provide a means for preventing voids by assuring:
 - I. The rear of the cutting head shall not advance in front of the leading edge of the casing by more than 1/3 times the casing diameter, and in stable cohesive soil conditions this distance shall not exceed 8 inches.
 - II. In unstable conditions, such as granular soil, loose or flowable materials, the cutting head is retracted into the casing a distance that permits a balance between pushing pressure, pipe advancement and soil conditions.
 - f. Methodology for adequate casing lubrication with a bentonite slurry, or other approved technique.
 - g. Techniques to provide an adequate band around the leading edge of the casing to provide extra strength in loose unstable materials when the cutting head has been retracted into the casing to reduce skin friction as well as provide a method for the slurry lubricant to coat the outside of the casing.
 - h. Equipment showing at least 20 feet of full diameter auger at the leading end of the casing. Subsequent auger size may be reduced, but the reduced auger diameter must be at least 75% of the full auger diameter.
 - i. Provisions for how water is to be injected inside the casing to facilitate spoil removal. The point of injection shall be no closer than 2 feet from the leading edge of the casing.
5. Submit a copy of any design exception prior to installation. Any deviation from the specifications requires a design exception and must be approved by the Engineer.
- D. RELATED WORK
1. City of Williston Specifications Sections:
 - a. 101-Removals
 - b. 102-Earthwork
 - c. 103-Trench Excavation
 - d. 104-Topsoil

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- e. 105-Seeding, Sodding, and Mulching
 - f. 201-Water Main Construction
 - g. 203-Cleaning and Disinfection
 - h. 204-Pressure and Leak Testing
 - i. 301-Sanitary Sewers
 - j. 307-Manholes and Inlets
2. NDDOT Standard Drawings and Specifications

714-P02 JACK AND BORE PRODUCTS: Jack and bore products shall be compliant with the following:

A. PIPE CASING

1. All costs associated with the construction of the 12 Inch steel pipe casing shall be paid as 724 1208 BORE & PUSH 8IN WATERMAIN bid item.
2. Steel pipe casings shall conform to the requirements of AWWA C200 and ASTM A139 (straight seam pipe only), Grade "B" with a minimum yield strength of 35,000 psi and be of a minimum thickness of ¼ inch. Pipe casing to be placed by jacking methods shall be of sufficient thickness and axial strength to withstand the forces to be encountered during the jacking process. The pipe shall be coated externally with coal-tar primer followed by hot coal-tar enamel in accordance with ANSI/AWWA C203. The casing shall be shop cut with ends square with centerline, leveled and welded so that the entire length of the casing shall be straight and true.
3. Field and shop welds of the casing pipes shall conform to the American Welding Society (AWS) standard specifications. Field welds shall be complete penetration (butt welded), single-bevel groove type joints in accordance with the requirements of ANSI/AWWA C206. Welds shall be airtight, continuous over the entire circumference of the pipe, and shall not increase the outside pipe diameter by more than 3/4-inch. Nor shall there be intrusion of the weld metal into the bore of the casing. It shall be the Contractor's responsibility to provide stress transfer across the joints which is capable of resisting the jacking forces involved.

B. CARRIER PIPE

1. The carrier pipe material shall be fusible PVC in accordance with the Construction Drawings and Specifications.

C. AUGERING FLUIDS

1. Augering fluids shall use a mixture of bentonite clay, or other approved stabilizing agent, mixed with potable water with a pH greater than 6.0 but not more than 9.0 to create the drilling fluid for lubrication and stabilization, as necessary. Vary the fluid viscosity to best fit the soil conditions encountered. Do not use other chemicals or polymer surfactant in the drilling fluid without written

consent of the Engineer. Certify in writing to the Engineer that any chemicals to be added are environmentally safe and not harmful or corrosive to the facility. Identify the source of water for mixing the drilling fluid. Approvals and permits are required for obtaining water from such sources as streams, rivers, ponds, or fire hydrants. Any water source used other than potable water shall require a pH test.

714-P03 JACK AND BORE EXECUTION: Jack and bore execution shall be compliant with the following:

A. GENERAL

1. The installation of pipeline casings under the highway, or arterial or collector roads (as shown on the Construction Drawings) shall be in accordance with all the requirements of the City of Williston and NDDOT.

B. DRAINAGE DITCH FLOW CONTROL

1. Contractor is responsible for control of water in drainage ditches near each end of the bore and jack alignment. See Note 714-P08 for hydrology information.

C. BORE PIT LOCATION

1. Bore pit location shall be determined by the Contractor.

D. EXCAVATION

1. A two-inch auger pilot hole shall first be attempted to determine if rock will prevent the installation of the casing. If the pilot hole is successfully made, the casing shall be installed.
2. The leading section of casing shall be equipped with a jacking head securely anchored thereto to prevent any wobble or variation in alignment during the jacking operation.
3. Excavation shall be performed entirely within the jacking head and no excavation in advance thereof shall be permitted. Every effort shall be made to avoid any loss of earth outside the jacking head.
4. Excavated material shall be removed from the casing as excavation progresses, and no accumulation of such material within the casing will be permitted.

E. JACK AND BORE

1. The jack and bore operations shall be done simultaneously with correct line and grade carefully maintained for the casing. Holes for casing shall be bored with an auger mounted inside the pipe with the auger extending a short distance beyond the lead end of the pipe to preclude caving.
2. Excavation and shoring for jacking pits shall be in accordance with applicable sections of this specification and fully comply with O.S.H.A. requirements.

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3. Carrier pipes shall be supported to prevent damages to either carrier pipe or casing pipe. The ends of the casing pipe shall be sealed with elastomeric end seals fastened with stainless steel bands installed at each end of casing after installation of the utility pipe.
4. The top of the casing shall maintain a minimum of 7.5-foot vertical clearance under the US-2 roadway surface and 3-foot vertical clearance under drainage ditches or as indicated on the Construction Drawings.
5. The invert elevations listed in the Construction Drawings for the individual roadway crossing shall be verified in the field by the Contractor such that the minimum clearances listed Note 714-P03 Part E Line 4 are maintained throughout bore alignment.

F. TOLERANCES

1. Extreme care shall be exercised by the Contractor to maintain line and grade during jacking operation, and the Contractor may be required to modify jacking operations to correct any deviation when deemed necessary by City, NDDOT, or the Engineer.

G. RESPONSIBILITY

1. The Contractor shall be fully responsible for the placement of the casing. The details shown on the Construction Drawings are to be considered minimum detail only.

H. INSTALLATION OF PIPE

1. The pressure of sliding carrier pipe into the casing shall not be applied directly to carrier pipe. A plank, timber, or other material acceptable to the Engineer shall be placed over the pipe end, during pushing, to protect it from damage.
2. The casing pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, or movement and distortion of surface features. Any damages caused by the Contractor's operations shall be corrected by the Contractor.

I. INSURANCE REQUIREMENTS AND FEES

1. All work performed within the NDDOT rights-of-way shall be in accordance with the requirements of NDDOT which are hereby made a part of these specifications. In the event of a conflict between specifications, the most stringent specification, as determined by the Engineer, shall apply.

J. SUCCESSFUL COMPLETION

1. The Contractor shall be considered as having completed the requirements of the jack and bore upon successful completion of the work to the satisfaction of the Engineer.

714-P04 FUSIBLE POLYVINYLCHLORIDE PIPE GENERAL: Fusible polyvinylchloride pipe shall be paid as 724 820 WATERMAIN 8IN Bid Item and shall include the features, installation procedures, and be compliant with the following:

A. DESCRIPTION

1. SCOPE

- a. This material specification covers requirements of fusible polyvinylchloride pipe
- b. Pipe shall conform to the following dimensionality and properties table:

| Pipe Description | Nominal Dia. (in.) | DR | Color | Pressure Class (psi) | Average Inner Dia. (in.) | Outside Dia. (in.) |
|------------------|--------------------|--------|-------|----------------------|--------------------------|--------------------|
| FPVC | 8 | SDR-21 | BLUE | 200 | 7.76 | 8.63 |

B. QUALITY ASSURANCE

1. REFERENCES

- a. References indicated shall mean the latest revision or issuance, unless specifically indicated in the table below:

| Reference | Title |
|------------|---|
| AWWA C605 | Standard for Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings (100mm Through 300mm), for Water Distribution |
| AWWA C651 | Disinfecting Water Mains |
| AWWA M23 | AWWA Manual of Supply Practices PVC Pipe—Design and Installation, Second Edition |
| ASTM D1784 | Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds |
| ASTM D1785 | Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 |
| ASTM D2152 | Test Method for Degree of Fusion of Extruded Poly(Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion |
| ASTM D2241 | Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR PR) |
| NSF-14 | Plastics Piping System Components and Related Materials |
| NSF-60 | Drinking Water Treatment Chemicals – Health Effects |
| NSF-61 | Drinking Water System Components--Health Effects |
| PPI TR-2 | PVC Range Composition Listing of Qualified Ingredients |

2. MANUFACTURER REQUIREMENTS

- a. All piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784.

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3. FUSION TECHNICIAN REQUIREMENTS

- a. Fusion Technician shall be qualified by the pipe supplier to install fusible polyvinylchloride pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.

4. SPECIFIED PIPE SUPPLIERS

- a. Underground Solutions, Inc., Poway, CA, (858) 679-9551.
- b. Other Engineer approved suppliers.

5. WARRANTY

- a. The pipe shall be warranted for one year per the pipe supplier's standard terms.
- b. In addition to the pipe warranty, the fusion services shall be warranted for one year per the fusion service provider's standard terms.

6. PRE-CONSTRUCTION SUBMITTALS

- a. The following PRODUCT DATA is required from the pipe supplier and/or fusion provider:
 - I. Pipe Size
 - II. Dimensionality
 - III. Pressure Class per applicable standard
 - IV. Color
 - V. Recommended Minimum Bending Radius
 - VI. Recommended Maximum Safe Pull Force
 - VII. Fusion technician qualification indicating conformance with this specification
- b. The following WORK PLAN AND INFORMATION is required from the Contractor and/or horizontal directional drilling Contractor:
 - I. Work plan shall include for each bore and jack installation any excavation locations and dimensions, interfering utilities, bore dimensions and locations including bend radii used, and traffic control schematics.
 - II. A project safety and contingency plan which shall include but shall not be limited to drilling fluid containment and cleanup procedures, equipment and plan for compromised utility installations including electrical and power lines, water, wastewater and any other subsurface utility in the area.

7. POST-CONSTRUCTION SUBMITTALS

- a. The following AS-RECORDED DATA is required from the Contractor and/or fusion provider to the Engineer:
 - I. Approved data logger device reports
 - II. Fusion joint documentation containing the following information:
 1. Pipe Size and Thickness
 2. Machine Size
 3. Fusion Technician Identification

4. Job Identification
5. Fusion Joint Number
6. Fusion, Heating, and Drag Pressure Settings
7. Heat Plate Temperature
8. Time Stamp
9. Heating and Cool Down Time of Fusion
10. Ambient Temperature

III. As-recorded Information

1. The as-recorded plan and profile will reflect the actual installed alignment, and reflect the horizontal offset from the baseline and depth of cover.
2. All fittings, valves, or other appurtenances will also be referenced and shown.
3. A daily project log, along with tracking log sheets, should they be used, shall be provided. Tracking log sheet data, should it be employed, shall include any and all that apply, including inclination, depth, azimuth, and hydraulic pull-back and rotational force measured.

714-P05 FUSIBLE POLYVINYLCHLORIDE PIPE PRODUCTS: Fusible polyvinylchloride pipe products shall include the features, installation procedures, and be compliant with the following:

A. FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR POTABLE WATER.

1. Fusible polyvinylchloride pipe shall conform to ASTM D2241 for standard dimensions, as applicable. Testing shall be in accordance with the referenced AWWA C605 and AWWA C651 standards.
2. Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
3. Fusible polyvinylchloride pipe shall be manufactured in a standard 40-foot nominal length, or custom lengths as specified.
4. Fusible polyvinylchloride pipe shall be blue in color for potable water use.
5. Pipe shall be marked as follows:
 - a. Nominal pipe size
 - b. PVC
 - c. Dimension Ratio
 - d. AWWA pressure class
 - e. AWWA standard designation number
 - f. NSF-61 mark verifying suitability for potable water service
 - g. Extrusion production-record code
 - h. Trademark or trade name

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- i. Cell Classification 12454 and/or PVC material code 1120 may also be included
- 6. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

B. FUSION JOINTS

- 1. Unless otherwise specified, fusible polyvinylchloride pipe lengths shall be assembled in the field with butt-fused joints. The fusion technician shall follow the pipe supplier's guidelines for this procedure. All fusion joints shall be completed as described in this specification.

C. CONNECTIONS AND FITTINGS

1. DUCTILE IRON MECHANICAL FITTINGS

- a. Acceptable fittings for use with fusible polyvinylchloride pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10, or AWWA/ANSI C153/A21.53 and AWWA/ANSI C111/A21.11.
- b. Connections to fusible polyvinylchloride pipe shall be made using MJ fittings.
- c. Bends, tees and other ductile iron fittings shall be restrained with the use of thrust blocking or other means as indicated in the construction documents.
- d. Ductile iron fittings and glands must be installed per the manufacturer's guidelines.

3. SLEEVE-TYPE COUPLINGS

- a. Sleeve-type mechanical couplings shall be manufactured for use with PVC pressure pipe, and may be restrained or unrestrained as indicated in the construction documents.
- b. Sleeve-type couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

4. EXPANSION AND FLEXIBLE COUPLINGS

- a. Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated in the construction documents.
- b. Expansion-type mechanical couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

5. CONNECTION HARDWARE

- a. Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

714-P06 FUSIBLE POLYVINYLCHLORIDE PIPE EXECUTION: Fusible polyvinylchloride pipe execution shall be compliant with the following:

A. DELIVERY AND OFF-LOADING

- 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. Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify Engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.
- 3. Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all of the pipe supplier's guidelines shall be followed.
- 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, the pipe shall not strike anything. Significant impact could cause damage, particularly during cold weather.
- 6. If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe shall be carefully lowered, not dropped, from trucks.
- 7. The area immediately WEST of the bore and jack operations at station 621+52 is available for the contractor's use in welding/fusing the fusible PVC pipe. The time available to use this area is not to exceed 7 days. Disturbed ground shall be reclaimed to existing conditions to the satisfaction of the Engineer and the City of Williston Parks and Recreation Department.

B. HANDLING AND STORAGE

- 1. Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the Engineer.
- 2. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the Engineer.
- 3. Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to

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the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

4. Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.
5. If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.
6. Pipe shall be stored and stacked per the pipe supplier's guidelines.

C. FUSION PROCESS

1. GENERAL

- a. Fusible polyvinylchloride pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.
- b. Fusible polyvinylchloride pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.
- c. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:
 - I. HEAT PLATE - Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.
 - II. CARRIAGE - Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.
 - III. GENERAL MACHINE - Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.
 - IV. DATA LOGGING DEVICE - An approved datalogging device with the current version of the pipe supplier's recommended and compatible software shall be used. Datalogging device operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an

independent 110V power source shall be available to extend battery life.

- d. Other equipment specifically required for the fusion process shall include the following:
 - I. Pipe rollers shall be used for support of pipe to either side of the machine
 - II. A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement, extreme temperatures, and/or windy weather, per the pipe supplier's recommendations.
 - III. An infrared (IR) pyrometer for checking pipe and heat plate temperatures.
 - IV. Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.
 - V. Facing blades specifically designed for cutting fusible polyvinylchloride pipe shall be used.

2. JOINT RECORDING

Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of fusible polyvinyl chloride pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Data not logged by the data logger shall be logged manually and be included in the fusion technician's joint report. This information shall be provided to the Engineer prior to installation.

D. DRILLING OPERATIONS

1. GENERAL

- a. Bore path and alignment are as indicated in the contract documents. The path of the bore may be modified based on field and equipment conditions. Entry and exit locations and control-point elevations shall be maintained as indicated in the contract documents.

2. LOCATION AND PROTECTION OF UNDERGROUND UTILITIES

- a. Correct location of all underground utilities that may impact the bore installation is the responsibility of the Contractor, regardless of any locations shown on the drawings or previous surveys completed.
- b. Utility location and notification services shall be contacted by the Contractor prior to the start of construction.
- c. All existing lines and underground utilities shall be positively identified, including

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exposing those facilities that are located within an envelope of possible impact of bore installation as determined for the project specific site conditions. It is the Contractor and bore system operator's responsibility to determine this envelope of safe offset from existing utilities. This will include, but is not limited to, soil conditions and layering, utility proximity and material, bore system and equipment, and foreign subsurface material.

3. SITE LOCATION PREPARATION

- a. Work site as indicated on drawings shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made

4. DRILLING LAYOUT AND TOLERANCES

- a. The drill path shall be accurately surveyed with entry and exit areas placed in the appropriate locations within the areas indicated on drawings. If using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.
- b. Instrumentation shall be provided and maintained at all times that accurately locates the pilot hole, measures drill-string axial and torsional loads and measures drilling fluid discharge rate and pressure.
- c. Entry and exit areas shall be drilled so as not to exceed the bending limitations of the pipe as recommended by the pipe supplier.

E. PIPE PULL-BACK AND INSERTION

- 1. Pipe shall be fused prior to insertion into one continuous length.
- 2. Contractor shall handle the pipe in a manner that will not over-stress the pipe prior to insertion. Vertical and horizontal curves shall be limited so that the pipe does not bend past the pipe supplier's minimum allowable bend radius, buckle, or otherwise become damaged. Damaged portions of the pipe shall be removed and replaced.
- 3. The pipe entry area shall be graded as needed to provide support for the pipe and to allow free movement into the bore hole.
 - a. The pipe shall be guided into the bore hole to avoid deformation of, or damage to, the pipe.
 - b. The fusible polyvinylchloride pipe may be continuously or partially supported on rollers or other Engineer approved friction decreasing implement during joining and insertion, as long as the pipe is not over-stressed or critically abraded prior to, or during installation.
 - c. A swivel shall be used between the reaming head and the fusible polyvinylchloride pipe to minimize torsion stress on the pipe assembly.

- 4. Buoyancy modification shall be at the sole discretion of the Contractor, and shall not exceed the pipe supplier's guidelines in regards to maximum pull force or minimum bend radius of the pipe. Damage caused by buoyancy modifications shall be the responsibility of the Contractor.

- 5. Once pull-back operations have commenced, the operation shall continue without interruption until the pipe is completely pulled through the casing.

F. INSTALLATION CLEANUP

- 1. Following the installation, the project site shall be returned to a condition equal to or better than the pre-construction condition of the site. All excavations will be backfilled and compacted per the construction documents and jurisdictional standards. All pavement and hardscape shall be repaired per applicable jurisdictional standards, excess materials shall be removed from the site, and disturbed areas shall be re-landscaped. All drilling fluid shall be properly disposed of per these specifications and all applicable jurisdictional laws.
- 2. Contractor shall verify that all utilities, structures, and surface features in the project area are sound.

714-P07 PIPE CONDUIT 6IN: PIPE CONDUIT 6IN shall be corrugated HDPE ADS N-12 WT 6 inch pipe with a capped West end and daylighted East end. Contractor shall coordinate exact location of PIPE CONDUIT 6IN with property owner, Bill Glen, 703-244-9797, and the Engineer prior to placement.

714-P08 DRAINAGE DITCH FLOW CONTROL: Contractor is responsible for control of water flow in drainage ditches and is to account for base flows and potential storm runoff in its means for controlling the drainage ditch flows throughout the construction of the waterline which crosses beneath the ditches. All costs for managing and maintaining drainage ditch flows during construction waterlines is to be included in the price for the 724 820 WATERMAIN 8IN bid item.

- A. The arch pipes being replaced underneath 11th Street, as part of the tied project, Project No. SOIB-SOIA-7-002(154)018, have a drainage area encompassing nearly 1200 acres. This includes over 300 acres of urban area (US 2 corridor from 18th Street south, and most of the residential area between 16th Ave and 24th Ave) and over 800 acres of rural area (the drainage northwest and west of the end of the airport runway, including the golf course airport meadow area).

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- B. There are no perennial stream in the drainage area, but it does generates a minimal base flow (groundwater infiltration, urban runoff) between 25 to 50 gpm during the construction season.
- C. Average monthly rainfall for Williston in inches is as follows: May – 1.93; Jun – 2.52; Jul – 2.56; Aug – 1.46; Sep – 1.06; Oct – 0.91. Due to the size of the drainage area storm runoff can be significant. A storm exceeding 80 cfs is expected annually. A storm exceeding 120 cfs is expected every two year period.

724-P01 WATERLINE CONSTRUCTION: Waterline construction shall include the features, materials, installation procedures, and be compliant with the following:

A. Materials

- 1. Materials shall be of the type called for on the plans and shall be in accordance with the following appropriate requirements. All materials shall meet the applicable ANSI/NSF Standards 60 or 61 and be so certified by NSF, UL or other organizations accredited by ANSI to test and certify such materials.
- 2. Watermain Pipe
 - a. Fusible Polyvinyl Chloride Pipe: (See Note 714-P05
 - b. Polyvinyl Chloride Pipe: Polyvinyl Chloride Pipe, when specified, shall be of quality conforming to requirements of ASTM D-2241 in accordance with ASTM D-1784 and the requirements of NSF Standards 14 and 61. PVC pipe shall be C900 pressure pipe, meeting the requirements of AWWA C-900 SDR 18 Class 150.
 - c. Ductile Iron Pipe: Ductile iron pipe, when specified, shall meet the requirements of AWWA C151, American National Standard for Ductile Iron Pipe. Wall thickness shall be Class 51 unless specified otherwise.
The interior of the pipe shall have a 1/16th inch cement mortar lining conforming to the requirements of AWWA C104. The outside surface of underground pipe shall receive a bituminous coal tar base coating approximately 1 mil thick.
Ductile iron pipe shall be provided with a polyethylene pipe jacket conforming to the requirements of AWWA C105.
 - d. Ductile Iron Fittings: Fittings shall be Class 350 fittings conforming to AWWA C153 or C110. Joints shall be mechanical joint conforming to AWWA C111. Fittings shall be coated with Fusion Bonded Epoxy. Mechanical joint bolts and nuts shall be stainless steel. Fittings shall be wrapped with polyethylene in accordance with AWWA C105.
 - I. Unless otherwise specified, PVC fittings will not be accepted.
 - e. Gate Valves: Gate valves shall be resilient seat gate valves with non-rising stems with the design, construction and materials

conforming to the latest standards of AWWA C509. Gate valves shall be Waterous or Mueller or approved equal. No operating rods.

- I. Gate valves shall have double "O" ring stem seals and 2 inch square operating nuts for key operation. All valves shall open counterclockwise.
- II. Gate valves shall be epoxy coated.
- III. Gate valves shall be furnished with mechanical joints. Bonnet and mechanical joint bolts and nuts shall be stainless steel.
- f. Pipe Couplings: Pipe couplings shall be ductile iron sleeves with ductile iron flanges, ductile iron mechanical joint solid sleeves with a minimum length of 12 inches, or Romac 501 cast couplings or equal. Bolts and nuts shall be stainless steel.
- g. Valve Boxes: The valve boxes furnished shall be of a quality equal to that manufactured by Mueller Company No. H-10357 with bases and dimensions of each section to be as follows:
 - I. No. 6 round base for 8 inch and smaller gate valves.
 - II. No. 160 oval base for 10 inch through 16 inch gate valves.
 - III. No. 162 oval base for 18 inch through 20 inch gate valves.
 - IV. No. 6 round base for all butterfly valves. Covers marked "Water".
 - V. Top Section 25.5 inches long. Center Section 60 inches long.
 - VI. Extension pieces as required, Mueller No. H-10363 or equal.
 - VII. All valve boxes shall be capable of a minimum 6 inch top adjustment in either direction, up or down, to or from, the finished curb grades shown on the plans.
- h. Hydrants: Waterous Pacer WB67-250 or approved equal hydrants shall be equipped with extended head, break-a-way type traffic flanges and two 2.5 inch hose connections with 7-1/2 threads per inch and one 4.5 inch pumper connection with 4 threads per inch. Hydrants shall have brass valve seats. Hydrants shall have mechanical joint connections with stainless steel nuts and bolts. The minimum bury depth shall be 90 inches. The traffic flange bolts shall be located 6 inches above the final grade. The traffic flange shall be no more than 6 inches above the final grade. The nozzle elevation shall be a minimum of 30 inches above final grade. The hydrants shall be surrounded by 2 cubic yards of subcut gravel so placed that it will readily take up all water from the drip valves. They hydrants shall be set on a concrete pad 6 inches thick and 48 inches square. The hydrants furnished shall be Waterous or approved equal.
- i. Insulation: Insulation shall consist of a double 2 inch layer (4 inches total) of

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- extruded polystyrene insulation meeting the requirements of AASHTO M-230.
- j. Tracer Wire: Tracer wire shall be Type THHN, AWG size #12, UL listed with a single copper conductor, PVC insulation, and nylon jacket.
3. CONSTRUCTION REQUIREMENTS: Water and Sewer work must be completed by Contractors holding a valid Sewer and Water Excavators License issued by the North Dakota State Plumbing Board. Contractors shall submit copies of their Sewer and Water Excavators License with the Construction Agreement.
- a. Equipment: All equipment necessary and required for the proper construction of water mains shall be on the project, and in good working condition, before construction is permitted to start.
- I. The Contractor shall provide appropriate hoisting equipment to handle the pipe while unloading and placing it in its final position without damage to the pipe.
- II. The Contractor shall provide hand tampers and pneumatic tampers to obtain the required compaction of the pipe bed and the backfill, as specified.
- b. Chlorination: After the new water mains and valved extensions have been tested, they shall be flushed until all foreign material has been removed. Chlorination applications may be made under the supervision of the Engineer. Water shall be fed into the new line with chlorine applied in amounts to produce at least 100 PPM and retained for three hours with the free chlorine not dropping below 50 ppm. The chlorine shall be flushed from the main through hydrants until all excess chlorine has been removed. No chlorination water will be permitted in the water main trench. The Contractor shall furnish all tools, equipment and material to chlorinate the water main.
- c. Handling Pipe and Accessories: Pipe, fittings, valves, hydrants and other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to, and distributed at the site of the project by the contractor. They shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or slid or rolled on skidways in such a manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground. In distributing the material at the site of work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. Pipe shall be handled in such a manner that a minimum of damage to the coating will result. Damaged coating shall be repaired and may be approved by the engineer. Pipe shall be placed on the site of the work parallel with the trench alignment

- and with bell ends facing the direction in which the work will proceed unless otherwise directed. The interior of all pipes, fittings and other accessories shall be kept free from dirt and foreign matter at all times. Valves and hydrants shall be drained before installation and stored in a manner that will protect them from damage by freezing.
- d. Sanitary Sewer Crossings: A minimum of 18 inches vertical clearance shall be maintained between the outside wall of any sewer line and the outside wall of any waterline that cross. Water mains installed above and within 5 feet of a sanitary sewer main and all water mains installed below a sanitary sewer main shall have a full 20 foot length of water main pipe centered on the sanitary sewer main.
- e. Blocking Hydrants and Fittings: All hydrants and tees and bends of 22.5 degrees and more, shall be provided with suitable concrete thrust blocking of adequate size to prevent movement of fittings and hydrants when the pipe is under pressure, the blocks shall allow pipe and fitting joints to be accessible for repair, and may be approved by the Engineer. The poured in place concrete must have sufficient time allowed for curing. See sheet W-4.
- f. Insulation: Insulation shall be installed whenever the water main or water service passes within 2 feet beneath a storm sewer. The insulation shall extend a minimum of 4 feet beyond the outer walls of the storm sewer.
- I. Insulation shall be on a firmly compacted and smooth base. Sand may be used to provide the base. Insulation shall be covered with 12 inches of sand or other suitable granular base prior to any compaction or additional backfill being placed.
- II. The insulation boards shall be placed in a stepped pattern so that joints are not continuous. Each layer shall be placed to cover the joints of the proceeding layer. The upper joint shall be no closer than 6 inches from the lower joint.
- g. Tracer Wire: Install continuous tracer wire attached to top of pipe.
- h. Contractor shall verify the horizontal and vertical location of existing waterlines within roadway intersections prior to installation of new waterline.
- i. All existing valves shall only be operated by authorized Williston City employees.
- j. Subsequent to activation of new water system, remove top box sections from all existing water valves to be abandoned in place.

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724-P02 WATERLINE PREPARATIONS FOR CONNECTIONS TO EXISTING: Waterline preparations for connections to existing pipeline shall be compliant with the following:

- A. Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the Contractor shall:
 - 1. Field verify location, size, piping material, and piping system of the existing pipe.
 - 2. Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.
 - 3. Have installed all temporary pumps and/or pipes in accordance with established connection plans.
- B. Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

724-P03 WATERLINE PRESSURE AND LEAKAGE TESTING: Waterline testing shall be compliant AWWA C605:

- A. Unless otherwise specified, hydrostatic testing of the pipeline shall be completed prior to final cleaning and disinfection. The Engineer may be present during the performance of all testing work and shall be notified with a written notice of the time and place of testing at least 3 days prior to commencement of the work. The Engineer may witness the opening and closing of all valves and shall be notified prior to the changing of the position of any valves during testing of the water line. All work shall be performed to the satisfaction of the Engineer and City.
 - 1. Testing Schedule and Procedure: A testing schedule and test procedure may be required for submittal to the Engineer for review and acceptance not less than 3 days prior to commencement of testing work. The schedule shall indicate the proposed time and sequence of testing of the pipeline. The testing procedure shall establish limits of the pipeline to be tested, the position of all valves during testing, the location of temporary bulkheads and test equipment, disposal of test water, and all other methods and procedures to be followed in performing the required testing work.
 - 2. Filling and Venting: Before filling the line with water, care shall be taken to ensure that all temporary venting devices are properly installed in the open position. Hand operated vent valves shall not be closed until water flows in an uninterrupted stream from each valve. Care shall be taken to ensure that the rate at which the line is filled with water does not exceed the venting capacity of the permanently installed air vent valves and devices.

- 3. Blocking and Backfilling: Piping shall be adequately blocked, anchored, and supported before the test pressure is applied.
- 4. Test Equipment: All necessary piping connections between the line to be tested and the water source, together with pumping equipment, water meter, pressure gauges, backflow protection, and other equipment, materials, and facilities required to perform the specified tests, shall be provided by the Contractor. All flanges, valves, bulkheads, bracing, blocking, and other sectionalizing devices required shall also be provided by the Contractor. All temporary sectionalizing devices shall be removed upon completion of testing. Vents shall be provided in test bulkheads where necessary to expel air from the line to be tested.
 - a. Test pressures shall be applied by means of a force pump sized to provide and maintain the required pressure without interruption during the test.
 - b. Water meters and pressure gauges shall be accurately calibrated and may be subject to review and acceptance by the Engineer.
 - c. Unless otherwise acceptable to the Engineer, drilling and tapping of permanently installed pipe walls will not be permitted.

B. PRESSURE TESTING: After the pipeline to be tested has been filled with water, the test pressure shall be applied and maintained within 5% without interruption for 2 hours plus additional time as required by the Engineer to examine all piping undergoing the test and for the Contractor to locate all defective joints and pipe materials.

- 1. Test Pressure: The pipeline shall be subject to a hydrostatic test pressure equivalent to 150 psi.

C. LEAKAGE TESTING: Following completion of pressure testing and acceptance by the Engineer, the pipeline shall be subjected to a leakage test. The duration of the leakage test shall be 2 hours plus additional time as required by the Engineer for an accurate determination of line leakage.

- 1. Leakage Test Pressure: The hydrostatic pressure maintained during leakage test shall be at least 75% but not more than 100% of the pressure specified for pressure testing of the pipeline and shall be maintained within $\pm 5\%$ during the entire time that leakage measurements are being performed.

- 2. Leakage Measurements: Measurements of leakage shall not be attempted until all trapped air has been vented and a constant test pressure has been established. After the pressure has stabilized, line leakage shall be measured by means of a suitable water meter installed in the pressure supply piping on the pipeline side of the force pump.

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3. Allowable Leakage: The term leakage, as used herein, shall be the total amount of water which must be introduced into the line during the leakage test to maintain the leakage test pressure. At the end of the test duration, if pressure is below the initial leakage test pressure, the pressure shall be increased to the initial leakage test pressure to determine total actual leakage.

a. No pipeline will be accepted if and while it exhibits a leakage rate in excess of that determined by the following formula:

$$Q = 0.0075 \text{ DLN}$$

where:

Q = Allowable leakage rate in gallons per hour

D = Nominal diameter of pipe in inches

L = Length of section tested in thousand feet

N = Square root of weighted average test pressure in psi

I. Whenever the pipeline to be tested contains pipe of different diameters, the allowable leakage rate shall be calculated separately for each diameter and corresponding length of line. Each separate leakage rate shall be added to obtain the total allowable leakage rate for the entire pipeline.

II. All joints in piping shall be water tight and free from visible leaks during the leakage test. Each leak which is discovered within the 1 year correction period shall be repaired by and at the expense of the Contractor regardless of any amount that the total line leakage rate, during the leakage test, may have been below the specified allowable leakage rate.

III. If the leakage test indicates a line leakage rate exceeding the allowable, the Contractor shall locate and repair leaking joints and other defective items to the extent required to reduce the line leakage rate to an acceptable amount.

724-P04 WATERLINE CLEANING AND DISINFECTION: Waterline cleaning and disinfection shall be compliant with the following:

A. Unless otherwise specified, hydrostatic testing of the pipeline shall be completed prior to final cleaning and disinfection. The Engineer may be present during the performance of all cleaning and disinfection work and shall be notified with a written notice of the time and place of cleaning and disinfection at least 3 days prior to commencement of the work. All work shall be performed to the satisfaction of the Engineer and City.

1. Governing Standard: All pipeline disinfection work shall conform to the requirements of ANSI/AWWA C651 and the requirements of the North Dakota Department of Health. All storage tank disinfection work shall conform to the requirements of ANSI/AWWA C652 and

the requirements of the North Dakota Department of Health. After final flushing and before the new water main and tanks are connected to the distribution system, two sets of acceptable bacteriological samples, taken at least 24 hours apart, shall be collected from the new main and tanks. Samples shall be delivered to a North Dakota Certified Laboratory. If any State requirements conflict with the provisions of this section, the State requirements shall govern.

2. Disinfection Plan: Unless otherwise specified, not less than 3 days prior to starting any disinfection work, the Contractor shall submit to the Engineer a detailed cleaning and disinfection plan. The plan shall cover the method and procedure proposed, including coordination, the time and sequence of operations, the limits of the pipeline to be cleaned and disinfected, the location of temporary bulkheads, equipment to be used, the manner of filling and flushing of lines, the neutralization and disposal of wasted water, and all other methods and procedures to be followed in performing the required cleaning and disinfection work.

3. Special Cleaning and Disinfection Requirements: Unless otherwise permitted by the Engineer or City, cleaning and disinfection of water mains shall comply with the following special requirements:

a. Temporary bulkheads shall be provided during cleaning and disinfection so that the flushing and disinfection work is not applied to existing water lines or to any portion that has been put into service of new lines installed under this contract.

b. The cleaning and disinfection work shall be conducted prior to connection to the existing water lines or to any portion that has been put into service of new lines installed under this contract.

4. Equipment and Facilities: The Contractor shall provide all necessary piping, connections, temporary valves, sampling taps, pumps, disinfectant, neutralization agents, chlorine residual test apparatus, and all other items of equipment or facilities required to complete the disinfection work.

5. Chlorine Residual Tests: The Contractor shall provide the necessary apparatus for the making of chlorine residual tests by the drop dilution method as set forth in Appendix A of ANSI/AWWA C651. Tests shall be made by the Contractor.

B. Pipeline Cleaning: The line shall be cleaned by flushing the line at the maximum velocity which can be developed until the line is free of dirt, debris, and other foreign materials. Cleaning of the line shall be completed prior to disinfection.

C. PIPELINE DISINFECTION PROCEDURE: The line shall be disinfected by the slug method.

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1. Unless otherwise permitted, the chlorination agent shall be injected into the line at the supply end of each new line or valve section thereof through a corporation cock installed in the top of the pipe.
 2. Admission of disinfection solution into or the flushing thereof through existing mains shall be held to the minimum possible, and then only after proper and adequate measures have been taken to effectively prevent any such solution of waste water from entering branch service connections to water customers.
 3. During disinfection, all valves and hydrants shall be operated to ensure that all appurtenances are disinfected. Valves shall be manipulated in such a manner that the strong chlorine solution in the line being chlorinated will not flow back into the supply line. Check valves shall be used if required.
 4. Existing mains or any portion that has been put into service of new mains installed under this contract, which would have been contaminated during work requiring connections to the new water line, involving either tapping or cutting into operations, shall be flushed and disinfected in accordance with Section 10 of ANSW/AWWA C651.
- D. FINAL FLUSHING AND NEUTRALIZATION PROCEDURE: All chlorinated water discharged shall be neutralized by dilution or chemical treatment and suitably disposed of in accordance with Section 6 and Appendix B of ANSI/AWWA C651.
1. The Contractor shall notify federal, state, and local regulatory agencies in accordance with the governing standard to determine if any special procedures or permits are required for disposal of neutralized or diluted chlorinated water. All requirements and costs associated with obtaining any discharge permit shall be the responsibility of the Contractor.
 2. Upon completion of chlorination, but before sampling and bacteriological testing, all heavily chlorinated water shall be removed from the line by flushing with potable water until the chlorine residual in the line is not higher than that generally prevailing in the remainder of the system or as acceptable to the Engineer or City. No chlorinated water will be permitted in the water main trench.
 3. Effective measures shall be initiated prior to the commencement of discharge of heavy chlorinated water to prevent pollution of drainage ditches, watercourses, water basins, sanitary sewer systems, and other applicable systems.
 4. The Contractor shall sample, test, and record the chlorine residual and time of test at several locations downstream of the discharge. Should the chlorine test indicate that the heavy chlorinated water is not neutralized, the Contractor shall take appropriate corrective measures to neutralize the discharge.

- E. BACTERIOLOGICAL TESTS: Sampling and testing of water in the line and tanks shall be performed after final flushing. Two tests shall be taken, at least 24 hours apart, in every 1,200 foot section of installed water line. Samples shall be taken as directed by the Engineer or City. Samples will be tested at a State of North Dakota certified testing laboratory. Disinfected water storage facilities will be sampled and tested by the Contractor in accordance with ANSI/AWWA C652. Written records of all test results shall be provided to the Engineer or City as soon as possible after the test is performed.
- F. REDISINFECTION: Should the bacteriological tests indicate the presence of coliform organisms at any sampling point, the line shall be reflushed, resampled, and retested. If check samples show the presence of coliform organisms, the line shall be rechlorinated until results acceptable to the Engineer or City are obtained.

724-P05 ABANDON WATERLINE: Plug ends of abandoned waterline with concrete.

724-P06 WATERLINE INSULATION: Waterline Insulation shall be paid as part of 724 830 WATERMAIN 8IN PVC Bid Item.

724-P07 SANITARY SEWER SERVICES: Sanitary sewer shall include the features, installation procedures, and be compliant with the following:

A. Materials:

1. Polyvinyl Chloride Sewer Pipe: Polyvinyl Chloride (PVC) Sewer Pipe, when specified, shall conform to the requirements of ASTM D-3034 for Type PSM, and shall have an SDR of 35. PVC sewer service pipe may have the elastomeric gasket type joint. PVC wye branches shall be of the "Factory Assembled" Type.
2. Sewer Connections: Connections to pipes of differing materials shall be made with FERNCO couplings equipped with stainless steel straps or approved equal.
3. Rubber Gasket Joints: Rubber type gaskets for PVC non-pressure pipe shall conform to the requirements of ASTM D3212.
4. O-Ring Rubber Gasket Joint for PVC Sewer Pipe: O-Ring Rubber Gaskets for PVC Sewer Pipe Joints shall be of the Elastomeric type providing a watertight seal.
5. Insulation: Insulation shall consist of a double 2 inch layer (4 inches total) of extruded polystyrene insulation meeting the requirements of AASHTO M-230.
6. Identification Marker Tape: Provide metallic core tape, green with black letters "CAUTION -

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NOTES

| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
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| ND | CPU-7-993(049)056 | 6 | 14 |

SEWER LINE BELOW" continuously printed plastic tape with metallic core, intended for direct-burial service; not less than 6-inch wide x 4 mils thick. Provide identification marking tape from one of the following:

- Seton Name Plate Corp.
- Reef Industries, Inc.
- Pro-Line Safety Products Co.

B. CONSTRUCTION REQUIREMENTS: Water and Sewer work must be completed by Contractors holding a valid Sewer and Water Excavators License issued by the North Dakota State Plumbing Board. Contractors shall submit copies of their Sewer and Water Excavators License with the Construction Agreement.

1. General: Sanitary sewer service connections shall be constructed in accordance to the specifications regarding Sanitary Sewer main construction contained in Note 724-P08 Part B.
 - a. Unless otherwise directed, sewer stub locations shall be marked with a 2" x 4" post extended from invert to 3 feet above the surface elevation and painted green.
2. Insulation: Insulation shall be installed whenever the sewer service passes within 2 feet beneath a storm sewer or whenever minimum cover depth of 10-1/2 feet is not maintained. When crossing a storm sewer, the insulation shall extend a minimum of 4 feet beyond the outer walls of the storm sewer.
 - a. Insulation shall be on a firm compacted and smooth base. Sand may be used to provide the base. Insulation shall be covered with 12 inches of sand or other suitable granular base prior to any compaction or additional backfill is placed.
 - b. The insulation boards shall be placed in a stepped pattern so that joints are not continuous. Each layer shall be placed to cover the joints of the proceeding layer. The upper joint shall be no closer than 6 inches from the lower joint.

724-P08 SANITARY SEWER CONSTRUCTION: Sanitary sewer construction shall include the features, installation procedures, and be compliant with the following:

A. Materials:

1. General: The pipe shall be of the type called for on the plans and shall be in accordance with the following appropriate requirements.
2. Polyvinyl Chloride Non-Pressure Sewer Pipe: Polyvinyl Chloride Sewer Pipe, when specified, shall conform to the requirements of ASTM D-3034 for Type PSM, PVC Sewer Pipe and Fittings and shall have an SDR of 35, all of which shall be stamped on the pipe. PVC sewer pipe and PVC sewer service pipe shall have the elastomeric gasket type joint providing a watertight seal. A solvent cement type

joint will not be allowed. PVC wye branches shall be of the "Factory Assembled" Type.

3. Rubber Gasket Joints: Rubber type gaskets for PVC non-pressure pipe shall conform to the requirements of ASTM D3212.
4. Mortar: Mortar for connections to manholes and sewers shall be composed of one part, by volume, of Portland Cement and two parts of mortar sand.
5. O-Ring Rubber Gasket Joint for PVC Sewer Pipe: O-Ring Rubber Gaskets for PVC Sewer Pipe Joints shall be of the Elastomeric type providing a watertight seal.
6. Insulation: Insulation shall consist of a double 2 inch layer (4 inches total) of extruded polystyrene insulation meeting the requirements of AASHTO M-230.
7. Identification Marker Tape: Provide metallic core tape, green with black letters "CAUTION - SEWER LINE BELOW" continuously printed plastic tape with metallic core, intended for direct-burial service; not less than 6-inch wide x 4 mils thick. Provide identification marking tape from one of the following:
 - Seton Name Plate Corp.
 - Reef Industries, Inc.
 - Pro-Line Safety Products Co.

B. CONSTRUCTION REQUIREMENTS: Water and Sewer work must be completed by Contractors holding a valid Sewer and Water Excavators License issued by the North Dakota State Plumbing Board. Contractors shall submit copies of their Sewer and Water Excavators License with the Construction Agreement.

1. Equipment: All equipment necessary and required for the proper construction of sewer mains shall be on the project, in good working condition and may be approved by the Engineer before construction is permitted to start.
 - a. The Contractor shall provide appropriate hoisting equipment to handle the pipe while unloading and placing it in its final position without damage to the pipe.
 - b. The Contractor shall provide hand tampers and pneumatic tampers to obtain the required compaction of the pipe bed and the backfill, as specified.
2. Connections to Existing Manholes: The Contractor shall carefully and in a workmanlike manner cut and remove the concrete or brick manhole to produce a hole no larger than necessary to accommodate the new pipe.
 - a. This manhole pipe joint shall utilize a GPK gasketed sanded manhole adaptor, or approved equal and shall be firmly grouted shut to produce a water tight joint.

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- b. The Contractor shall repair any damage to the existing manhole caused by the connection of the new sewer pipe.
- c. It will generally be necessary to remove and reconstruct the manhole's concrete shelves and inverts to accommodate the new sewer. Reconstruction of the shelves and inverts shall be with concrete mortar. The Contractor shall remove all construction debris from the manhole and prevent any debris from entering the existing sewer system.
- 3. Handling Pipe and Accessories: Pipe, fittings, manholes and other accessories shall, unless otherwise directed, be unloaded, hauled to and distributed at the site of the project by the contractor. They shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or slid or rolled on skidways in such a manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground. In distributing the material at the site of work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. Pipe shall be placed on the site of the work parallel with the trench alignment and with bell ends facing the direction in which the work will proceed unless otherwise directed. The interior of all pipes, fittings and other accessories shall be kept free from dirt and foreign matter at all times.
- 4. Pipe Laying: Minimum depth of cover required for all sewer mains and laterals is 10-1/2 feet. If this minimum cover cannot be achieved, insulation will be required, see Williston City Standard Specification 301-3.6. After the trench has been excavated to the proper grade, the first pipe at the outlet end of the sewer shall be bedded to the proper line and grade with the bell end upstream.
 All pipes shall be laid to line and grade. The pipe shall be held in place by backfilling along the bottom and sides of the pipe section with bedding material thoroughly tamped up to the centerline of the pipe and protected from movement. During the pipe laying operation, the Contractor shall have a watertight plug available to install in the last pipe laid at the end of each workday, or to install during the work day, to prevent water or other foreign material from entering the newly installed pipe. The interior of the pipe shall be cleaned as the work progresses. The manholes and sewer pipe shall be flushed with clean water after completion and prior to acceptance by the City. The Contractor shall exercise due care so as to prevent water and other foreign matter from entering the newly constructed sewer mains at new manhole locations. All joints shall be installed in accordance with the pipe manufacturer's instructions.

- 5. Water Main Crossings: Sewer mains crossing a water main shall have a full 20 foot length of sewer main pipe centered on the water line.
- 6. Insulation: Insulation shall be installed whenever the sewer main passes within 2 feet beneath a storm sewer or whenever minimum cover depth of 10-1/2 feet is not maintained. When crossing a storm sewer, the insulation shall extend a minimum of 4 feet beyond the outer walls of the storm sewer.
 - a. Insulation shall be on a firm compacted and smooth base. Sand may be used to provide the base. Insulation shall be covered with 12 inches of sand or other suitable granular base prior to any compaction or additional backfill being placed.
 - b. The insulation boards shall be placed in a stepped pattern so that joints are not continuous. Each layer shall be placed to cover the joints of the proceeding layer. The upper joint shall be no closer than 6 inches from the lower joint.

724-P09 SANITARY SEWER TESTING: Sanitary sewer testing shall be compliant with the following:

- A. Leakage Testing for Non-Pressure Piping: All gravity sewer shall be tested by either hydrostatic or low air pressure tests. The leakage outward or inward (exfiltration or infiltration) shall not exceed 25 gallons per inch of pipe diameter per mile per day for any section of the system. Exfiltration or infiltration testing shall be performed with a minimum positive head of two feet. If low pressure air testing is used it shall be in conformance with either ASTM F1417 or UNI-B-6. The selection of what test to use shall consider groundwater elevations at the time of the test.
- B. Deflection Testing for Non-Pressure Piping: At least 30 days after completion of backfill, a deflection test will be performed prior to owner's acceptance of completed work. Deflection testing shall be conducted using a go/no-go mandrel with a diameter not less than 95% of the base inside diameter of the pipe. No pipe shall exceed 5 percent deflection. The percent deflection shall be established from the base inside diameter of the pipe. The mandrel shall be approved by the owner or engineer prior to use.
- C. Low Pressure Air Testing: Upon completion of the sewer and after the line has been backfilled and cleaned, the Contractor shall furnish all necessary equipment and personnel to conduct a low pressure air test on all gravity plastic pipe sewer lines sized 30 inches in diameter or less. The test shall be conducted in the presence of the Engineer or City representative between two manholes in succession and in accordance with ASTM F-1417,

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NOTES

as modified herein. The Contractor shall notify the Engineer or City representative with a written notice a minimum of 3 days prior to testing. All costs for performing the test shall be included in the price of the installed pipe.

1. The sewer pipe section under test shall be clean at the time of testing, but the pipe may be wetted. Pneumatic plugs each having a length greater than the diameter of the pipe being tested shall be used to plug the pipe ends at manholes. One plug shall have the air supply hose and the return air pressure hose. The air supply hose, connected from the compressor to the plug, shall have a throttling valve, bleeding valve, and shut off valve for control. The air pressure tap shall have a sensitive pressure gauge, 1 to 10 psi range, protected by a gauge cock and a pressure relief valve set a 10 psi. The gauge must be in 0.1 pound increments. The testing gauge shall be located at ground level, out of and away from the manhole. Air shall be slowly introduced into the plugged line until the internal air pressure reaches 4.0 psig greater than the average back pressure of any ground water pressure that may submerge the pipe. At least two minutes shall be allowed for the air temperature to stabilize before readings are taken and the timing started, during which time the air supply shall be regulated to maintain the pressure between 3.5 and 4.0 psig. After the stabilization period the air supply shall be shut off and timing begun.
2. The sewer section under test will be accepted as having passed the low pressure air test if it does not lose air at a rate to cause the pressure to drop more than 0.5 psig in less time than ½ minute per inch diameter of the pipe tested. If the pipe fails to meet the requirements of the test, the Contractor shall, at his sole expense, determine the source of leakage and repair/replace defective material and/or workmanship, after which, the low pressure air test and deflection test, if applicable, shall be performed again.
3. To determine the air pressure to be added for the average ground water above the pipeline, the ground water height in feet above the pipeline shall be divided by 2.31, and that incremental pressure added to the gauge pressure. A table for converting water height to gauge pressure is as follows:

| Ground Water Level Over Top of Pipeline | Incremental Air Pressure to be Added to Gauge Pressure Readings |
|---|---|
| 1 foot | 0.43 psig (4.43 psig total) |
| 2 feet | 0.86 psig (4.86 psig total) |
| 4 feet | 1.72 psig (5.72 psig total) |
| 8 feet | 3.44 psig (7.44 psig total) |
| 10 feet | 4.30 psig (8.30 psig total) |
| Over 10 feet | *DO NOT PERFORM TEST |

** If the air pressure required to run the test exceeds 8.3 psig, the Contractor shall lower the groundwater to acceptable levels by means of dewatering (incidental) and perform the test.*

- D. Televising: All gravity sewers shall be televised by the Contractor. The video shall be submitted to the Engineer for approval within 5 days of the televising. Any abnormalities such as, but not limited to, deviations of grade, misaligned joints, cracked/defected pipe, rolled gaskets, shall be repaired by the Contractor at his expense. Sections requiring repair shall be retelevised to verify condition of repair. Any/all costs associated with televising shall be incidental to the 724 1110 8IN SANITARY SEWER PIPE Bid Item.

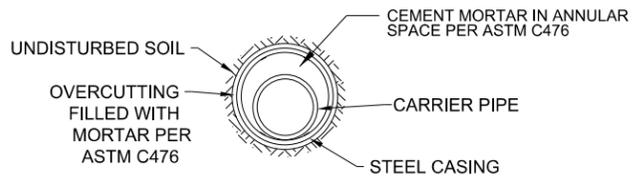
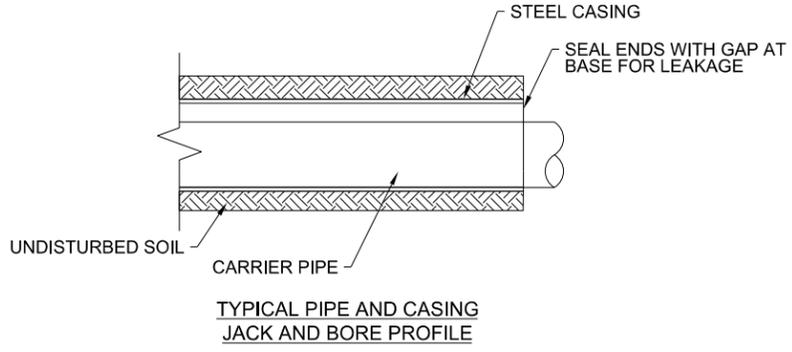
910-P01 MODIFY MANHOLE: Modify Manhole Bid item shall include all labor and materials necessary for a fully functioning manhole including but not limited to cutting and removing the existing 8 inch sanitary sewer pipe, sealing the removed 8 inch sewer pipe opening with mortar, and coring and mortaring, the new 8 inch sanitary sewer pipe into the existing manhole being modified as shown in the plan sheets.

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ESTIMATE OF QUANTITIES

| | | | |
|-------|-------------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | CPU-7-993(049)056 | 8 | 1 |

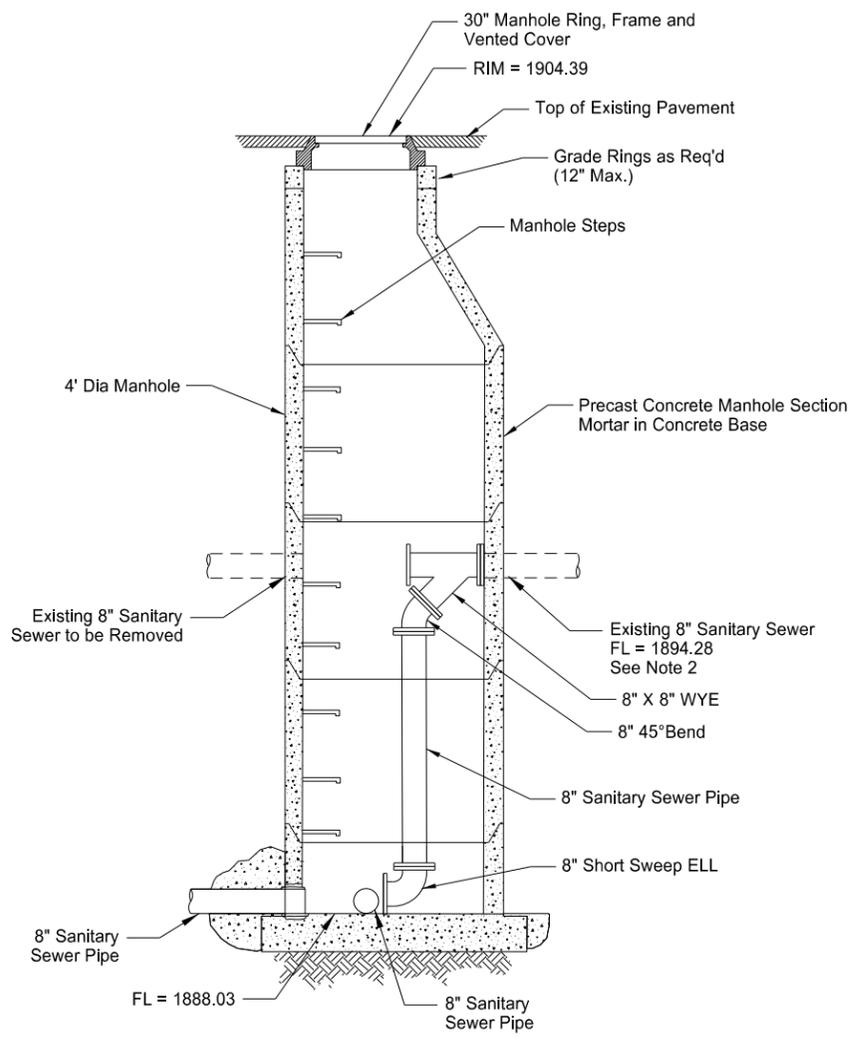
| SPEC | CODE | ITEM DESCRIPTION | UNIT | QUANTITY |
|------|------|-----------------------------------|-------|----------|
| 103 | 0100 | CONTRACT BOND | L SUM | 0.20 |
| 103 | 0200 | ESCROW OF BID DOCUMENTATION | L SUM | 0.20 |
| 702 | 0100 | MOBILIZATION | L SUM | 0.20 |
| 714 | 4070 | PIPE CONDUIT 6IN | LF | 84 |
| 722 | 0300 | MANHOLE SANITARY | EA | 4 |
| 724 | 0300 | GATE VALVE & BOX 6IN | EA | 2 |
| 724 | 0310 | GATE VALVE & BOX 8IN | EA | 3 |
| 724 | 0322 | GATE VALVE & BOX 18IN | EA | 4 |
| 724 | 0411 | 6IN HYDRANT | EA | 1 |
| 724 | 0425 | RESET HYDRANT | EA | 1 |
| 724 | 0430 | REMOVE HYDRANT | EA | 1 |
| 724 | 0820 | WATERMAIN 8IN | LF | 215 |
| 724 | 0830 | WATERMAIN 8IN PVC | LF | 355 |
| 724 | 1110 | 8IN SANITARY SEWER PIPE | LF | 880 |
| 724 | 1155 | PIPE DUCTILE IRON 18IN | LF | 1166 |
| 724 | 1208 | BORE & PUSH 8IN WATERMAIN | LF | 215 |
| 724 | 6030 | ABANDON WATER MAIN / SERVICE LINE | EA | 2 |
| 724 | 6822 | 8IN 22.5DEG BEND | EA | 2 |
| 724 | 6825 | 8IN 45DEG BEND | EA | 3 |
| 724 | 6847 | 18IN 22.5DEG BEND | EA | 2 |
| 724 | 6850 | 18IN 45DEG BEND | EA | 4 |
| 724 | 6980 | 8IN X 8IN X 6IN TEE | EA | 1 |
| 724 | 6988 | 18IN X 18IN X 8IN TEE | EA | 2 |
| 724 | 7010 | 8IN X 6IN REDUCER | EA | 1 |
| 724 | 7011 | 8IN TEE | EA | 1 |
| 910 | 0570 | MODIFY MANHOLE | EA | 1 |



TYPICAL PIPE AND CASING SECTION DETAIL

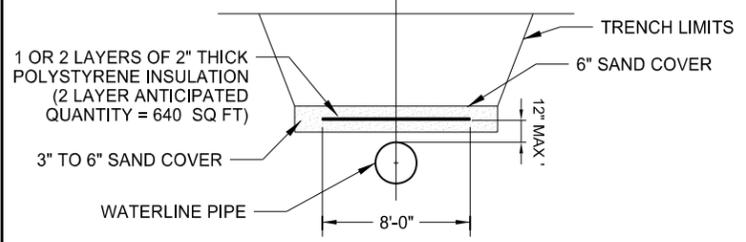
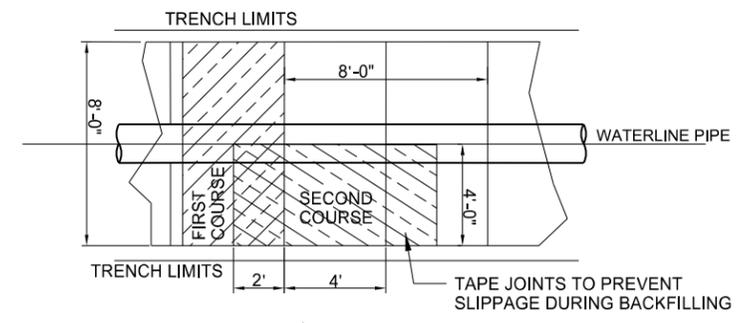
| FUSED PVC JOINT CARRIER PIPE SIZE (INCHES) | MINIMUM STEEL CASING SIZE (INCHES) | MINIMUM STEEL CASING THICKNESS (INCHES) |
|--|------------------------------------|---|
| 8 | 12 | 0.250 |
| 10 | 14 | 0.250 |
| 12 | 16 | 0.281 |
| 14 | 18 | 0.312 |

- NOTES:
- CARRIER PIPE JOINTS TO BE FUSED PVC.
 - CASING SHALL BE CONSTRUCTED TO PREVENT LEAKAGE OF GROUNDWATER AND SOIL INTO THE CASING THROUGHOUT ITS LENGTH.
 - EACH END OF CASING PIPE SHALL BE SEALED TO PREVENT COLLECTION OF WATER AND SOIL IN CASING. A GAP SHALL BE LEFT FOR DRAINAGE IN CASE OF LEAKAGE.
 - CASING PIPE SHALL BE WELDED SMOOTH STEEL MEETING ASTM A36 SPECIFICATIONS WITH A MINIMUM YIELD STRENGTH OF 36,000 PSI.
 - THE DIAMETER AND THICKNESS OF THE CASING PIPE SHALL BE AS LISTED IN THE TABLE ON THIS SHEET.
 - THE ANNULAR SPACE BETWEEN THE CASING AND THE BORE SHALL BE FILLED WITH CEMENT MORTAR PUMPED UNDER PRESSURE. THE MORTAR SHALL CONFORM TO ASTM C476 AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 200-PSI. PRESSURE MORTAR SHALL TAKE PLACE WITHIN 24 HOURS OF FINAL PLACEMENT OF THE CASING PIPE.



MANHOLE DETAIL
MANHOLE (4) Sta 627+09.9 - 4.0 Lt

- Notes:
- MANHOLE CONSTRUCTION SHALL FOLLOW CITY OF WILLISTON STANDARD DRAWING S-1 SANITARY SEWER MANHOLE.
 - CUT EXISTING PIPE AND SEAL EXISTING 8" SANITARY SEWER PIPE INTO EAST SIDE OF MANHOLE WITH GPK SANDED MANHOLE ADAPTER AND MORTAR.



| INSULATION REQUIREMENTS | |
|-------------------------|----------------------|
| INVERT DEPTH | INSULATION THICKNESS |
| 3' - 5' | 4" |
| 5' - 7' | 2" |
| >7' | 0" |

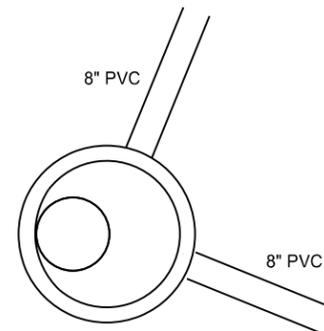
WATER LINE INSULATION DETAIL
Sta 621+69 - 25' Rt to Sta 621+84 - 62' Rt

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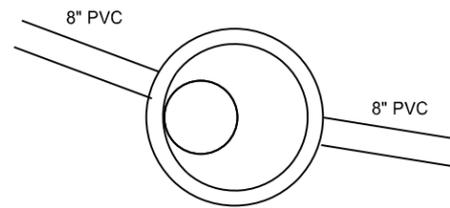
General Details
 Williston City 11th Street
 New Utilities

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|--|-------|-------------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | CPU-7-993(049)056 | 50 | 1 |

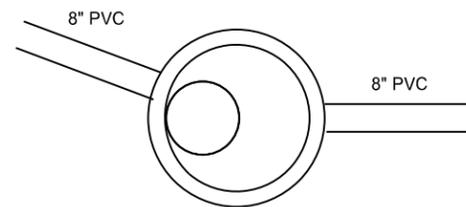
Manhole No. ①
Sta 619+10.9 - 1.0' Rt
Type 48" Manhole
Rim Elev 1901.55
Base Elev 1890.48
Invert NW (8") Elev 1891.24
Invert NE (8") Elev 1891.22



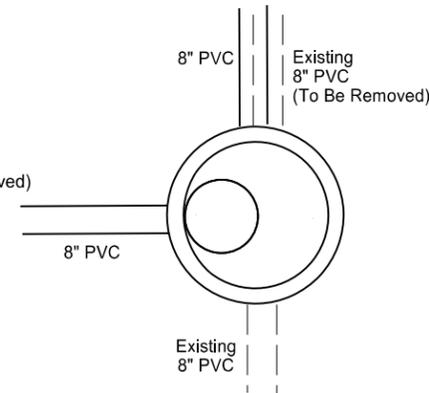
Manhole No. ②
Sta 622+45.2 - 3.2' Rt
Type 48" Manhole
Rim Elev 1902.15
Base Elev 1889.14
Invert SW (8") Elev 1889.90
Invert NE (8") Elev 1889.88



Manhole No. ③
Sta 623+34.8 - 0.0' Rt
Type 48" Manhole
Rim Elev 1902.53
Base Elev 1888.78
Invert SW (8") Elev 1889.54
Invert N (8") Elev 1889.52



Manhole No. ④
Sta 627+09.9 - 4.0' Lt
Type 48" Manhole
Rim Elev 1904.39
Base Elev 1887.28
Invert W (8") Elev (Existing To Be Removed)
Invert W (8") Elev 1888.02
Invert E (8") Elev 1894.28 (Existing)
Invert S (8") Elev 1888.04

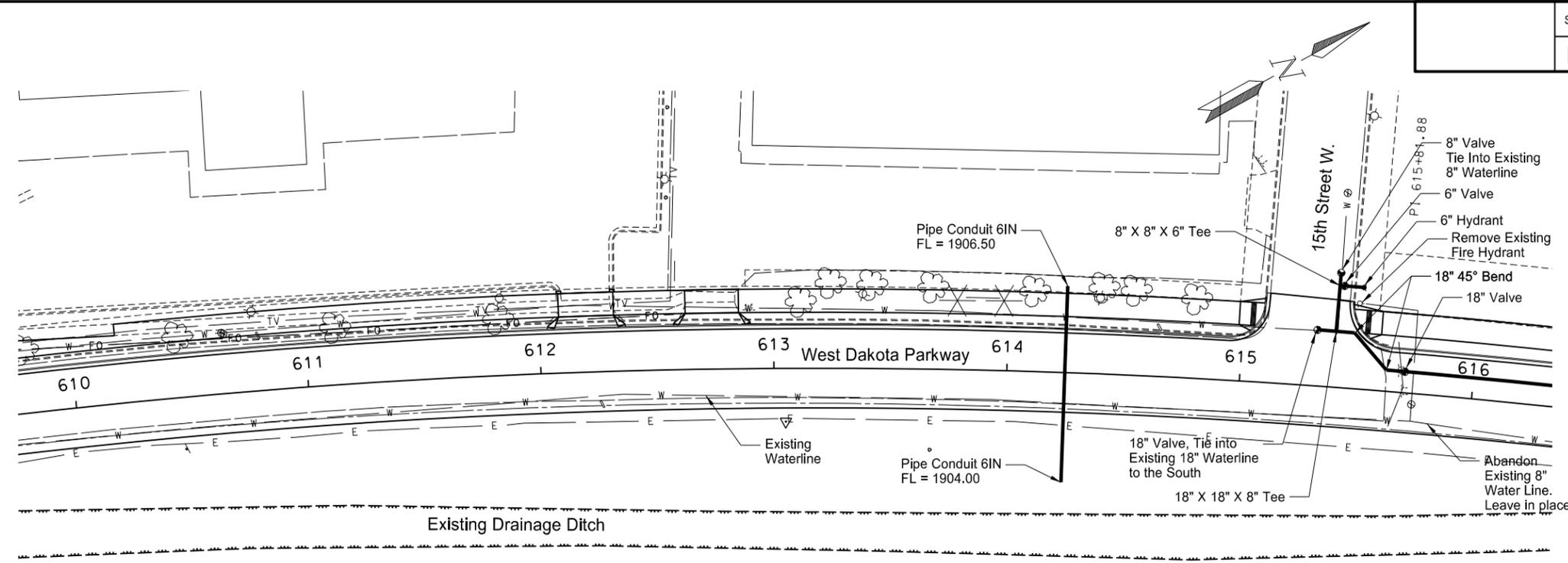


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Inlet & Manhole Summary

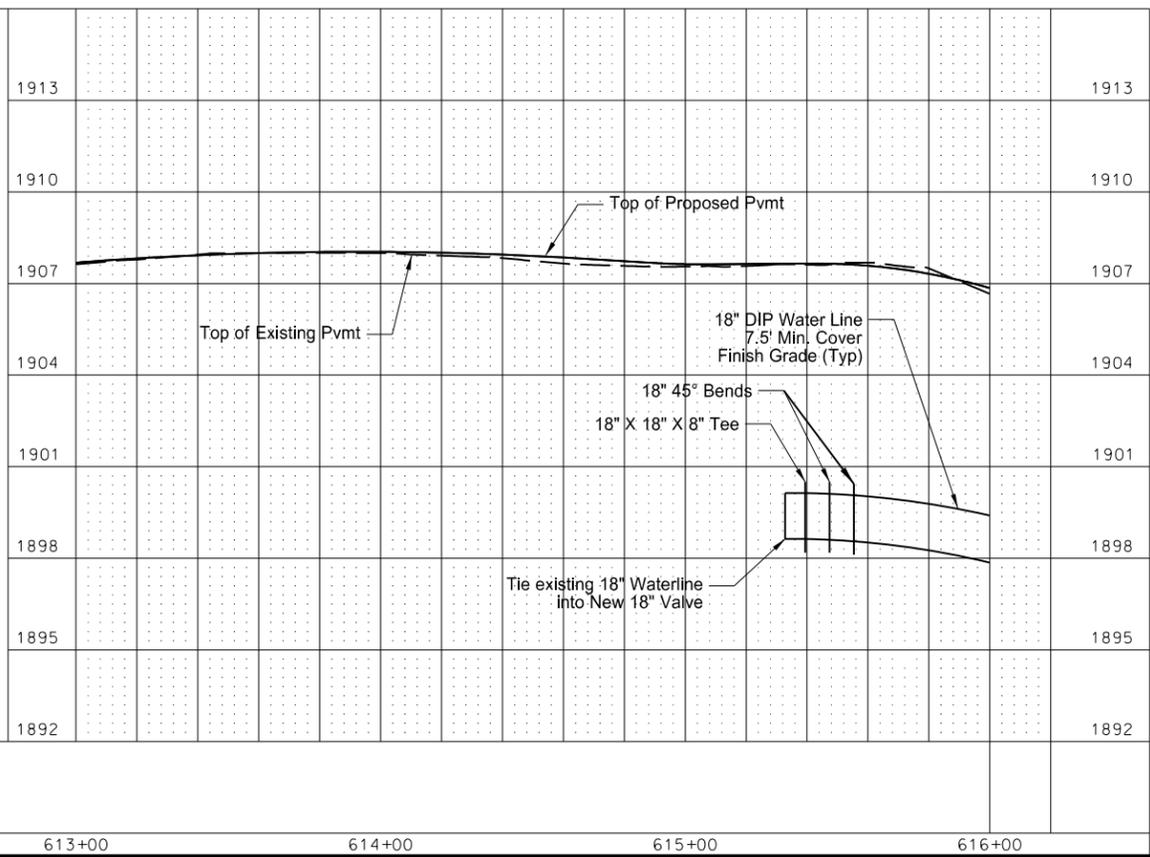
Williston City 11th Street
New Utilities

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|-------|-------------------|-------------|-----------|
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| ND | CPU-7-993(049)056 | 60 | 2 |



| SPEC CODE | BID ITEM | QTY | UNIT |
|-----------|---|----------------|------|
| 714 4070 | PIPE CONDUIT 6IN Sta 614+25 - 37' Lt To Sta 614+25 - 47' Rt | 84 | LF |
| | Total | 84 | LF |
| 724 300 | GATE VALVE & BOX 6IN Sta 615+42 - 44' Lt | 1 | EA |
| | Total | 1 | EA |
| 724 310 | GATE VALVE & BOX 8IN Sta 615+40 - 49' Lt | 1 | EA |
| | Total | 1 | EA |
| 724 322 | GATE VALVE & BOX 18IN Sta 615+32 - 24' Lt Sta 615+71 - 9' Lt | 1 | EA |
| | Total | 2 | EA |
| 724 411 | 6IN HYDRANT Sta 615+50 - 43' Lt | 1 | EA |
| | Total | 1 | EA |
| 724 430 | REMOVE HYDRANT Sta 615+49 - 37' Lt | 1 | EA |
| | Total | 1 | EA |
| 724 830 | WATERMAIN 8IN PVC Sta 615+40 - 24' Lt to Sta 615+40 - 49' Lt | 25 | LF |
| | Total | 25 | LF |
| 724 1155 | PIPE DUCTILE IRON 18IN Sta 615+32 - 24' Lt to Sta 615+48 - 24' Lt Sta 615+48 - 24' Lt to Sta 615+63 - 9' Lt Sta 615+63 - 9' Lt to Sta 616+00 - 9' Lt | 16 21 37 | LF |
| | Total | 74 | LF |
| 724 6030 | ABANDON WATER MAIN/SERVICE LINE Sta 615+78 - 12' Rt | 1 | EA |
| | Total | 1 | EA |
| 724 6850 | 18IN 45DEG BEND Sta 615+48 - 24' Lt Sta 615+63 - 9' Lt | 1 1 | EA |
| | Total | 2 | EA |
| 724 6980 | 8IN X 8IN X 6IN TEE Sta 615+40 - 44' Lt | 1 | EA |
| | Total | 1 | EA |
| 724 6988 | 18IN X 18IN X 8IN TEE Sta 615+40 - 24' Lt | 1 | EA |
| | Total | 1 | EA |

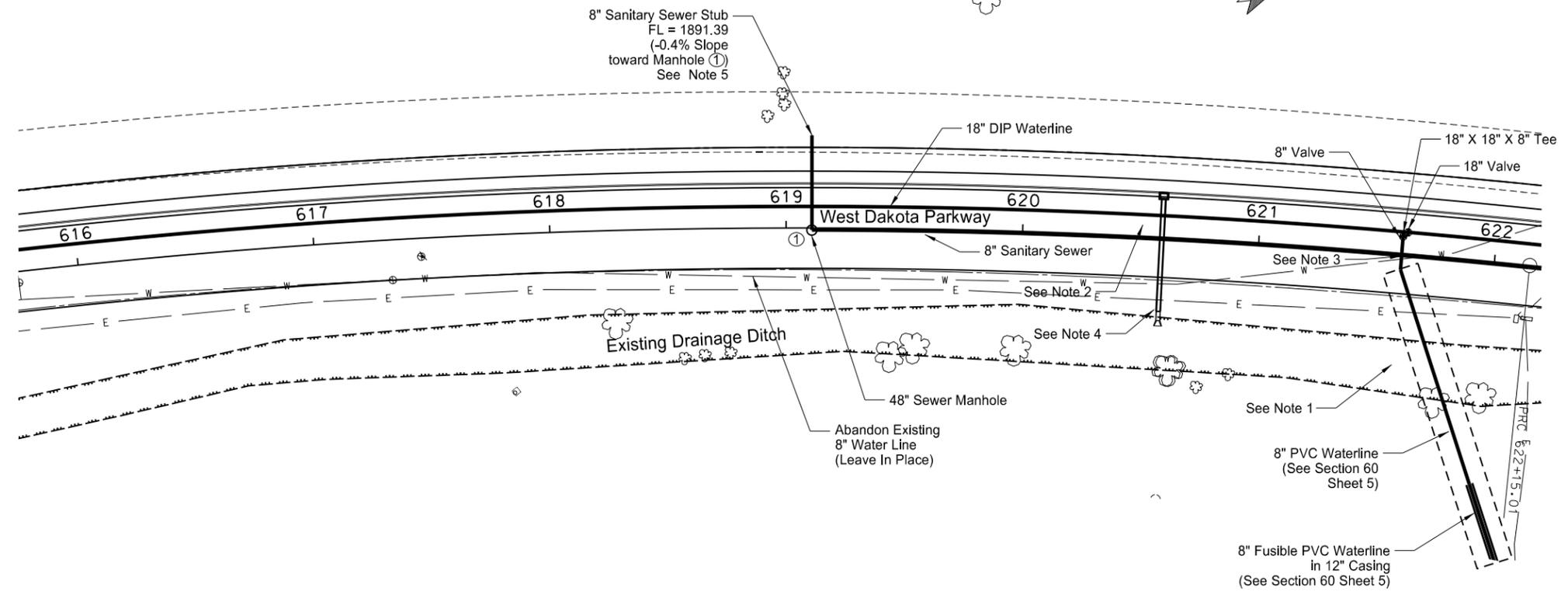
Existing Drainage Ditch



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Utility Plan & Profile
 Sta 610+00 to Sta 616+00
 Williston City 11th Street
 New Utilities

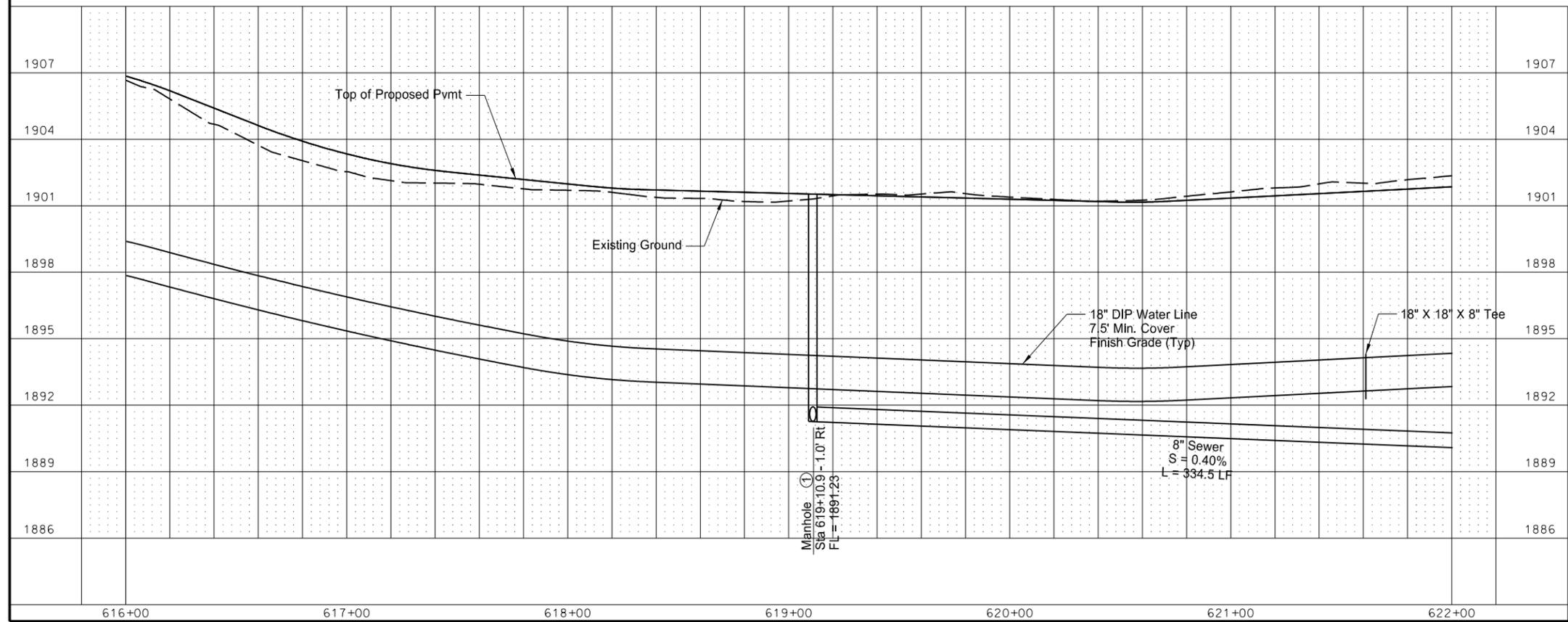
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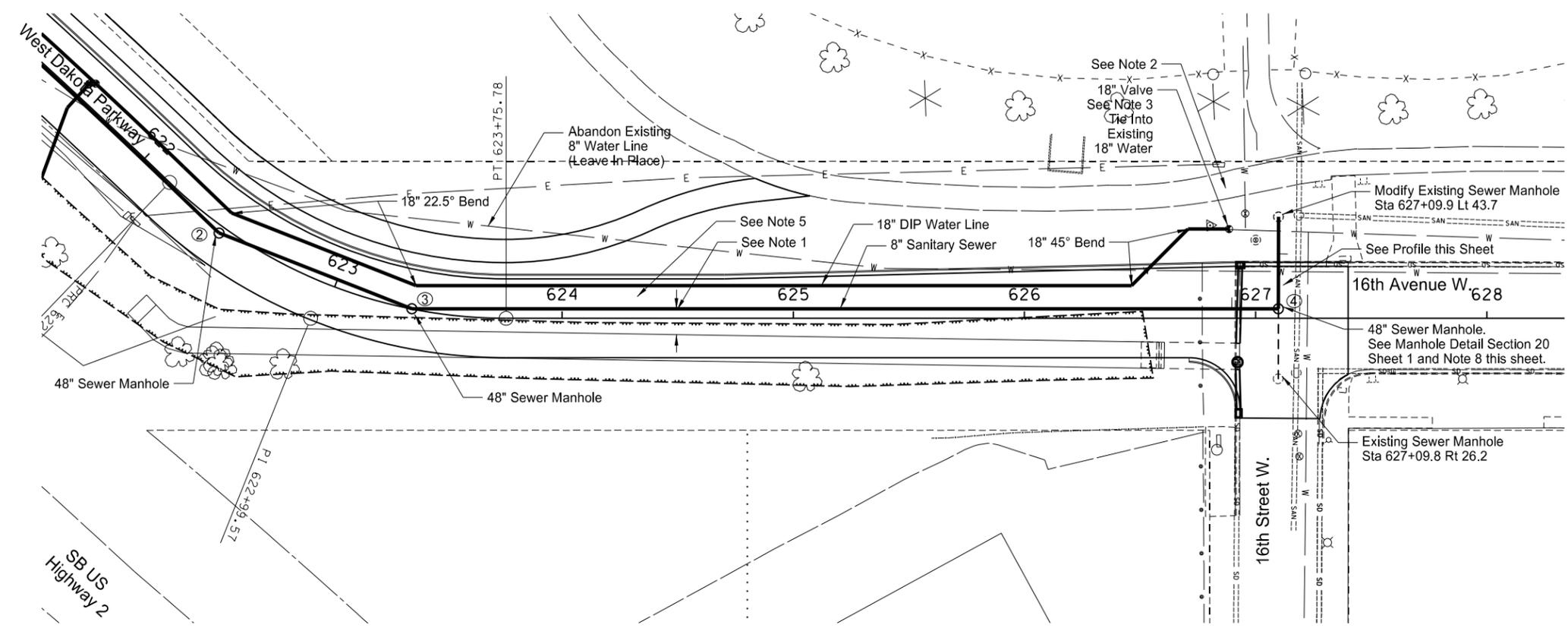
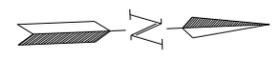
| SPEC CODE | BID ITEM | QTY | UNIT |
|-----------|---|-----|------|
| 722 300 | MANHOLE SANITARY | | |
| ① | Sta 619+10.91 - 1' Rt | 1 | EA |
| | Total | 1 | EA |
| 724 310 | GATE VALVE & BOX 8IN | | |
| | Sta 621+61 - 7' Lt | 1 | EA |
| | Total | 1 | EA |
| 724 322 | GATE VALVE & BOX 18IN | | |
| | Sta 621+63 - 9' Lt | 1 | EA |
| | Total | 1 | EA |
| 724 830 | WATERMAIN 8IN PVC | | |
| | Sta 621+66 - 9' Lt to Sta 621+61 - 7' Rt | 16 | LF |
| | Total | 16 | LF |
| 724 1155 | PIPE DUCTILE IRON 18IN | | |
| | Sta 616+00 - 9' Lt to Sta 621+23 - 9' Lt | 523 | LF |
| | Sta 621+23 - 9' Lt to Sta 622+00 - 9' Lt | 77 | LF |
| | Total | 600 | LF |
| 724 6988 | 18IN X 18IN X 8IN TEE | | |
| | Sta 621+61 - 9' Lt | 1 | EA |
| | Total | 1 | EA |
| 724 1110 | 8IN SANITARY SEWER PIPE | | |
| | Sta 619+11 - 39' Lt to Sta 619+11 - 1' Rt | 40 | LF |
| | Sta 619+11 - 1' Rt to Sta 622+00 - 1' Rt | 290 | LF |
| | Total | 330 | LF |

- NOTE:
- Contractor is responsible for control of water in drainage ditch throughout the boring process. Bore pit location is determined by contractor.
 - Maintain a minimum 10 ft horizontal separation between sanitary sewer and waterline.
 - Maintain a minimum of 18 inches vertical separation at crossing point of sanitary sewer and waterline.
 - Storm drain pipe construction is not part of subject project, but constructed as part of tied NDDOT project No. SOIB-SOIA-7-002(154)018.
 - 8" sanitary sewer stub shall extend 5 feet West of new sidewalk (new sidewalk is constructed as part of tied project) and shall be plugged with a PVC cap. Install a green 2" x 4" marker from stub to 3 feet above grade.

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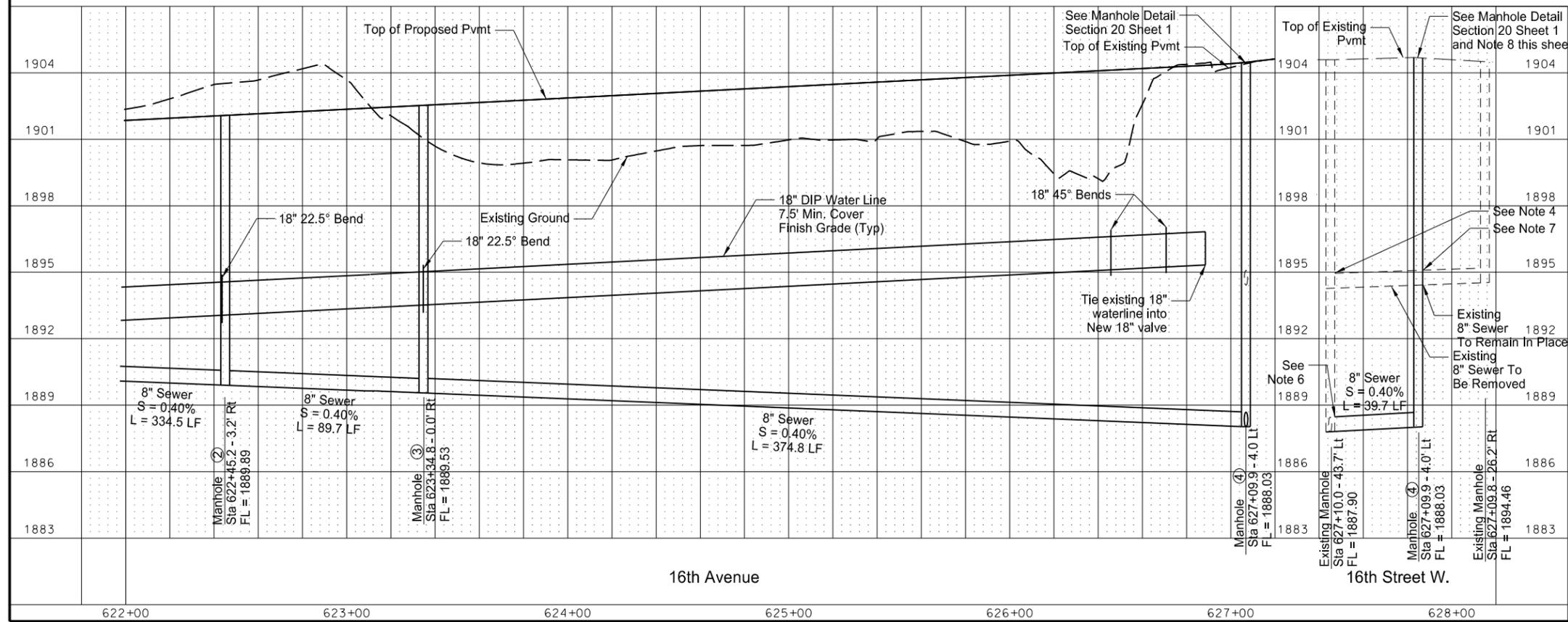
Utility Plan & Profile
 Sta 616+00 to Sta 622+00
 Williston City 11th Street
 New Utilities



| SPEC | CODE | BID ITEM | QTY | UNIT |
|------|------|--|-----|------|
| 722 | 300 | MANHOLE SANITARY | | |
| ② | | Sta 622+45.2 - 3.2' Rt | 1 | EA |
| ③ | | Sta 623+34.8 - 0.0' Rt | 1 | EA |
| ④ | | Sta 627+09.9 - 4.0' Lt | 1 | EA |
| | | Total | 3 | EA |
| 724 | 322 | GATE VALVE & BOX 18IN | | |
| | | Sta 626+89 - 38' Lt | 1 | EA |
| | | Total | 1 | EA |
| 724 | 1110 | 8IN SANITARY SEWER PIPE | | |
| | | Sta 622+00 - 1' Rt to Sta 622+45 - 3' Rt | 45 | LF |
| | | Sta 622+45 - 3' Rt to Sta 623+35 - 0' Rt | 90 | LF |
| | | Sta 623+35 - 0' Rt to Sta 627+10 - 4' Lt | 375 | LF |
| | | Sta 627+10 - 4' Lt to Sta 627+10 - 44' Lt | 40 | LF |
| | | Total | 550 | LF |
| 724 | 1155 | PIPE DUCTILE IRON 18IN | | |
| | | Sta 622+00 - 9' Lt to Sta 622+45 - 7' Lt | 44 | LF |
| | | Sta 622+45 - 7' Lt to Sta 623+35 - 10' Lt | 86 | LF |
| | | Sta 623+35 - 10' Lt to Sta 626+46 - 14' Lt | 309 | LF |
| | | Sta 626+46 - 14' Lt to Sta 626+71 - 38' Lt | 35 | LF |
| | | Sta 626+71 - 38' Lt to Sta 626+89 - 38' Lt | 18 | LF |
| | | Total | 492 | LF |
| 724 | 6030 | ABANDON WATER MAIN / SERVICE LINE | | |
| | | Sta 626+71 - 20' Lt | 1 | EA |
| | | Total | 1 | EA |
| 724 | 6847 | 18IN 22.5DEG BEND | | |
| | | Sta 622+45 - 7' Lt | 1 | EA |
| | | Sta 623+35 - 10' Lt | 1 | EA |
| | | Total | 2 | EA |
| 724 | 6850 | 18IN 45DEG BEND | | |
| | | Sta 626+46 - 14' Lt | 1 | EA |
| | | Sta 626+71 - 38' Lt | 1 | EA |
| | | Total | 2 | EA |
| 910 | 0570 | MODIFY MANHOLE | | |
| | | Sta 627+10 - 44' Lt | 1 | EA |
| | | Total | 1 | EA |

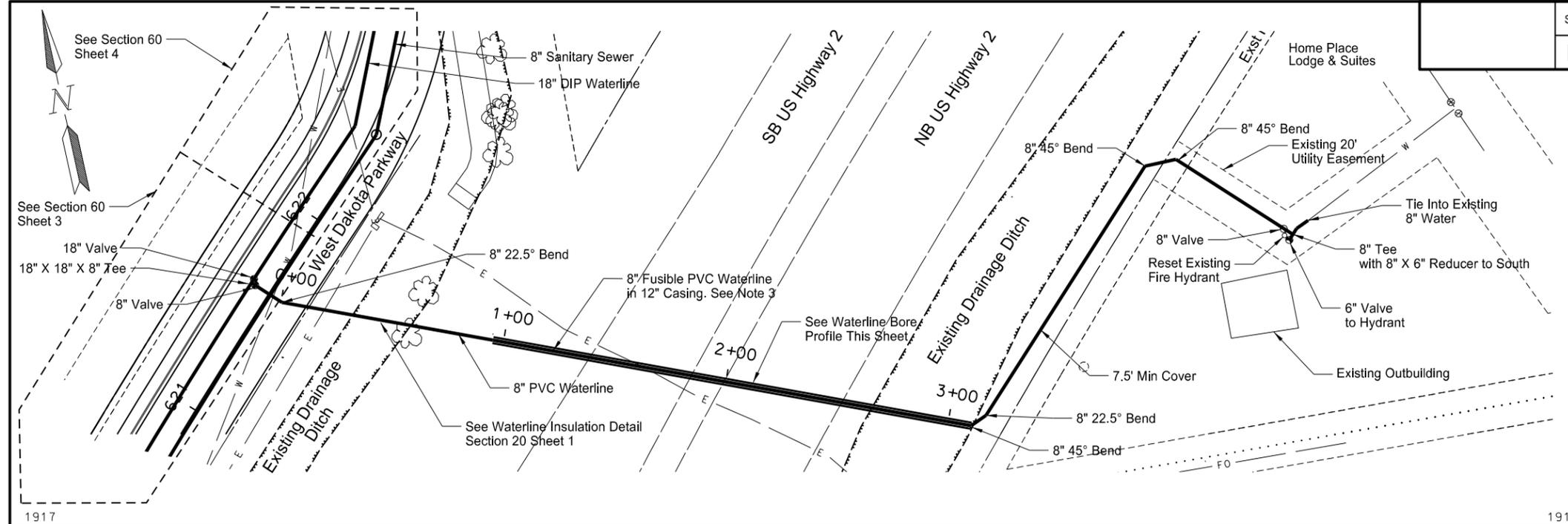
- NOTES:
- Maintain 10' horizontal separation between sanitary sewer and box culvert.
 - Avoid impacts to existing path.
 - Install valve riser 3" above grade.
 - Remove 8" sewer pipe and seal sewer pipe opening as part of MODIFY MANHOLE bid item.
 - Maintain a minimum 10' horizontal separation between sanitary sewer and water line.
 - Core and install GPK standard manhole adapter and mortar 8" sewer pipe into existing manhole as part of MODIFY MANHOLE bid item.
 - Core and install GPK standard manhole adapter and mortar existing 8" sewer pipe into East side of proposed manhole.
 - The cost and installation of fittings for drop inside of manhole ④ shall be included in the price of MANHOLE SANITARY bid item.

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Utility Plan & Profile
 Sta 622+00 to Sta 628+00
 Williston City 11th Street
 New Utilities

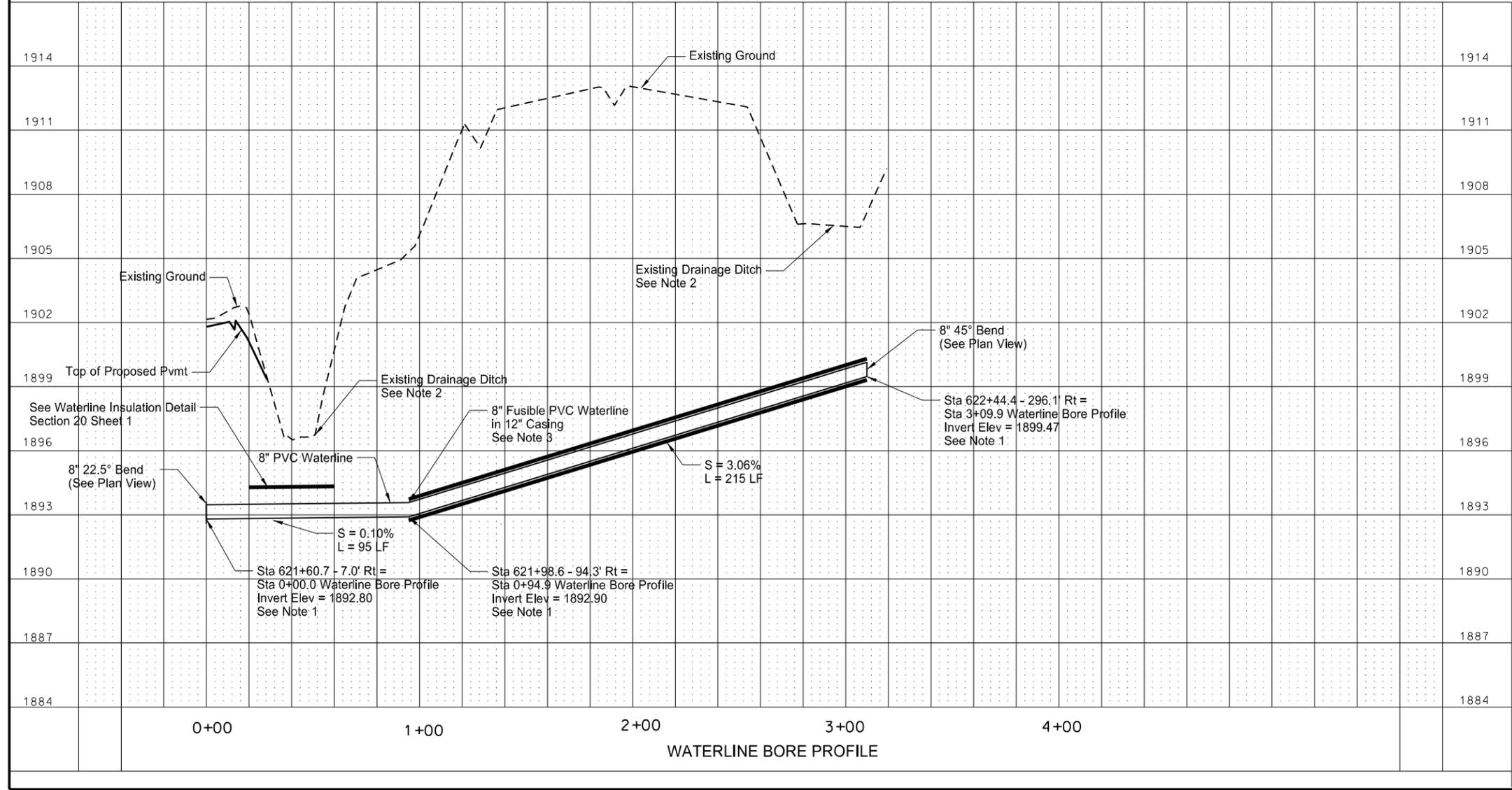
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|-------|-------------------|-------------|-----------|
| STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| ND | CPU-7-993(049)056 | 60 | 5 |



| SPEC CODE | BID ITEM | QTY | UNIT |
|-----------|---|-----|------|
| 724 300 | GATE VALVE & BOX 6IN Sta 622+92 - 400' Rt | 1 | EA |
| Total | | 1 | EA |
| 724 310 | GATE VALVE & BOX 8IN Sta 622+93 - 399' Rt | 1 | EA |
| Total | | 1 | EA |
| 724 425 | RESET HYDRANT Sta 622+92 - 400' Rt | 1 | EA |
| Total | | 1 | EA |
| 724 1208 | BORE & PUSH 8IN WATERMAIN Sta 621+99 - 94' Rt to Sta 622+44 - 296' Rt | 215 | LF |
| Total | | 215 | LF |
| 724 6822 | 8IN 22.5DEG BEND Sta 621+61 - 7' Rt Sta 622+47 - 300' Rt | 1 | EA |
| Total | | 2 | EA |
| 724 6825 | 8IN 45DEG BEND Sta 622+44 - 296' Rt Sta 622+98 - 333' Rt Sta 623+00 - 346' Rt | 1 | EA |
| Total | | 3 | EA |
| 724 820 | WATERMAIN 8IN Sta 621+99 - 94' Rt to Sta 622+44 - 296' Rt | 215 | LF |
| Total | | 215 | LF |
| 724 830 | WATERMAN 8IN PVC Sta 621+61 - 7' Rt to Sta 621+99 - 94' Rt Sta 622+44 - 296' Rt to Sta 622+47 - 300' Rt Sta 622+47 - 300' Rt to Sta 622+98 - 333' Rt Sta 622+98 - 333' Rt to Sta 623+00 - 346' Rt Sta 623+00 - 346' Rt to Sta 622+92 - 403' Rt Sta 622+92 - 403' Rt to Sta 622+95 - 408' Rt | 95 | LF |
| Total | | 314 | LF |
| 724 7010 | 8IN X 6IN REDUCER Sta 622+93 - 400' Rt | 1 | EA |
| Total | | 1 | EA |
| 724 7011 | 8IN TEE Sta 622+93 - 400' Rt | 1 | EA |
| Total | | 1 | EA |

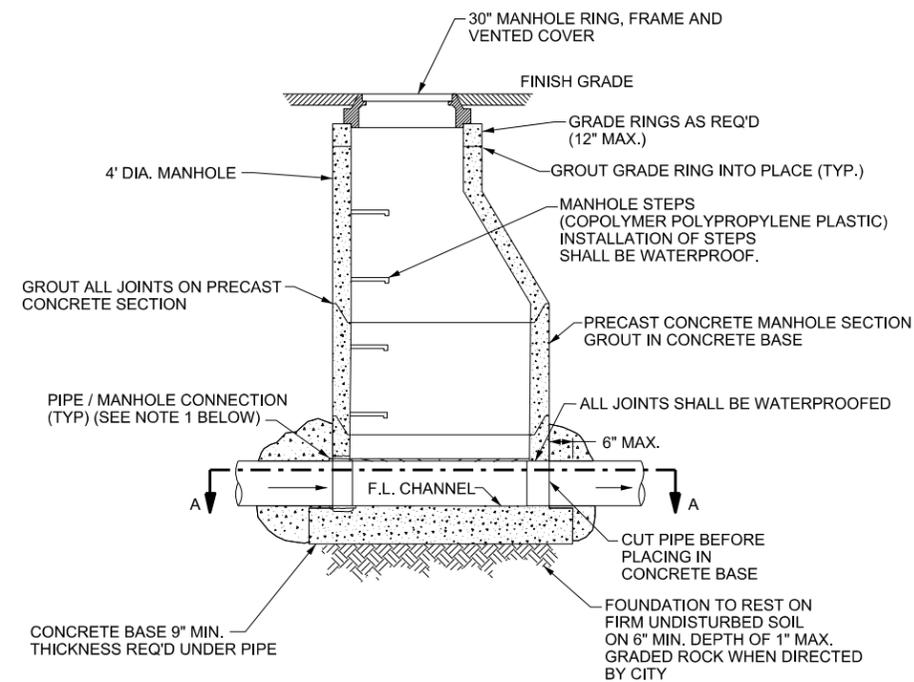
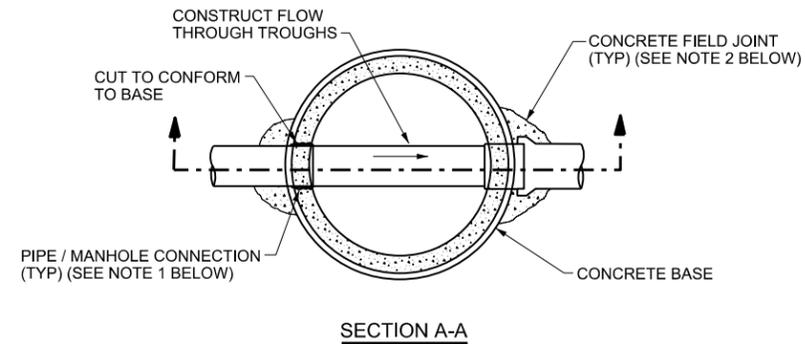
- NOTES:
- Invert elevation shown shall be verified by contractor.
 - Contractor is responsible for preventing water in drainage ditches from affecting the work throughout the boring process. Bore pit locations are determined by Contractor.
 - All costs associated with construction of the 12" casing shall be paid as BORE & PUSH 8IN WATERMAIN bid item. All costs associated with construction of the 8" Fusible PVC pipe shall be paid as WATERMAIN 8IN bid item.

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Utility Plan & Profile
 Boring Under US-2
 Williston City 11th Street
 New Utilities

| | | | | |
|--|-------|-------------------|-------------|-----------|
| | STATE | PROJECT NO. | SECTION NO. | SHEET NO. |
| | ND | CPU-7-993(049)056 | | S-1 |



NOTES:

1. INSTALL 8" THICK CONCRETE FIELD JOINT AROUND ALL SANITARY SEWER PIPES (TYP.)
2. MANHOLE RING AND COVER SHALL MATCH GRADE AND CROSS SLOPE OF ROADWAY. ("TWIST", ROTATING OR ADJUSTABLE MANHOLE RING AND COVER MAY BE REQUIRED.)
3. TOP OF MANHOLE COVER SHALL BE SET TO FINAL GRADE PRIOR TO PAVING
4. USE BOLT DOWN LID WITH STAINLESS STEEL ANCHOR BOLTS WHERE NOTED



TYPICAL DETAIL

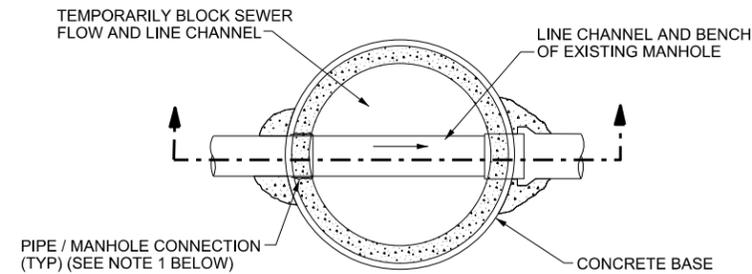
SANITARY SEWER MANHOLE

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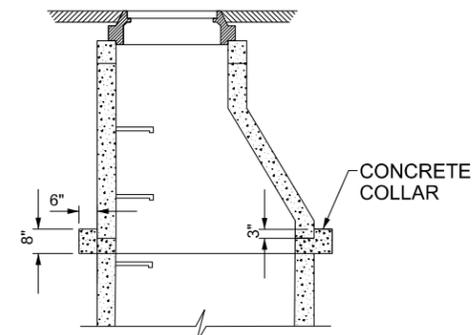
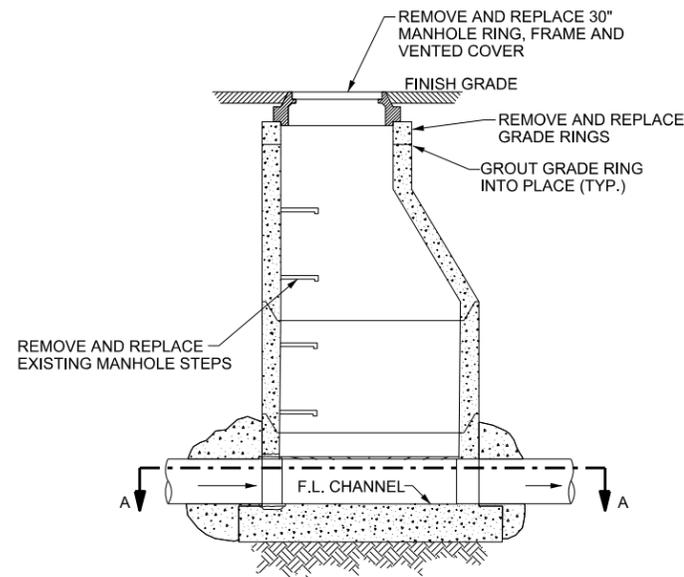
Sanitary Sewer Manhole

Williston City 11th Street
 New Utilities

| | | | |
|-------|-------------------|-------------|-----------|
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SECTION A-A



REPLACEMENT OF CONE SECTION

NOTE:
WHERE UPPER MANHOLE SECTION IS DAMAGED OR CONSTRUCTED OF BRICK, REMOVE AND REPLACE WITH CONCRETE CONE SECTION AND RISER. CONE SECTION SHALL BE EMBEDDED 3" MINIMUM IN CONCRETE COLLAR.

- NOTES:
1. MANHOLE RING AND COVER SHALL MATCH GRADE AND CROSS SLOPE OF ROADWAY. ("TWIST", ROTATING OR ADJUSTABLE MANHOLE RING AND COVER MAY BE REQUIRED.)
 2. TOP OF MANHOLE COVER SHALL BE SET TO FINAL GRADE PRIOR TO PAVING
 3. MANHOLE STEPS INSTALLED INTO FRACTURED SUBSTRATE SHALL BE EPOXY REINFORCED

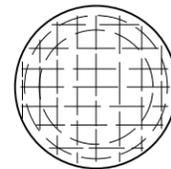
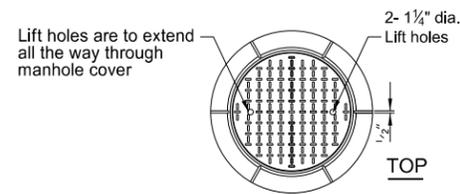

City of WILLISTON
 TYPICAL DETAIL
 LINE AND / OR
 RECONSTRUCT MANHOLE

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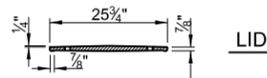
Line and / or Reconstruct Manhole

 Williston City 11th Street
 New Utilities

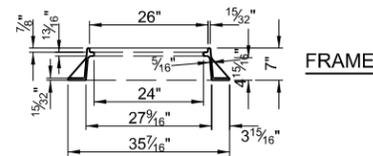
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| ND | CPU-7-993(049)056 | | S-3 |



TOP VIEW



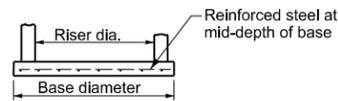
LID



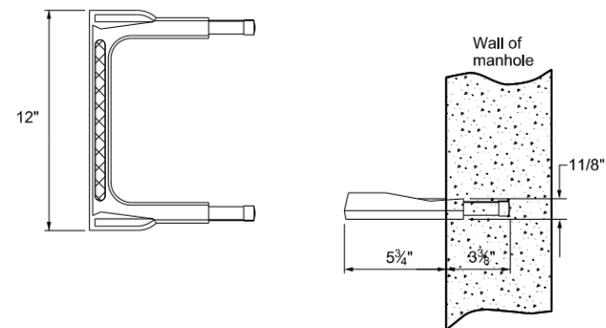
FRAME

MANHOLE CAST IRON RING & COVER

Lid - Wt. 118 Lbs.
Frame - Wt. 131 Lbs.



PRECAST MANHOLE BASE



STEP DETAIL

Manhole steps shall be copolymer polypropylene plastic. Steps to be firmly embedded and shall meet ASTM C-497 tests for withstanding pulling out. Steps to be aligned vertically and spaced 12 inches on center with the top step no greater than 24" from top of casting.



TYPICAL DETAIL

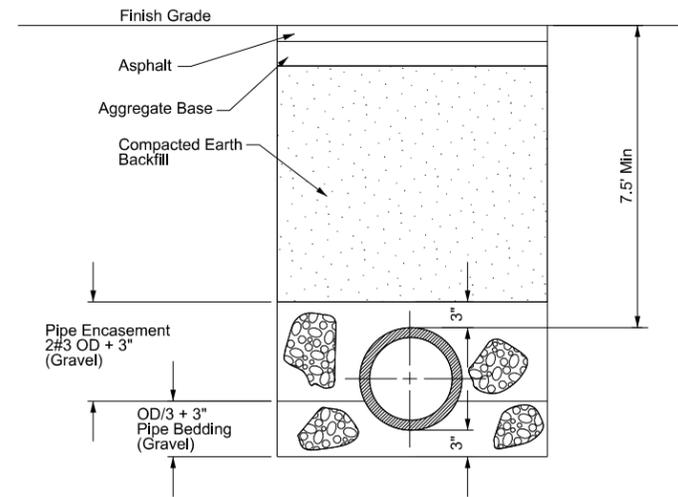
MANHOLE DETAILS

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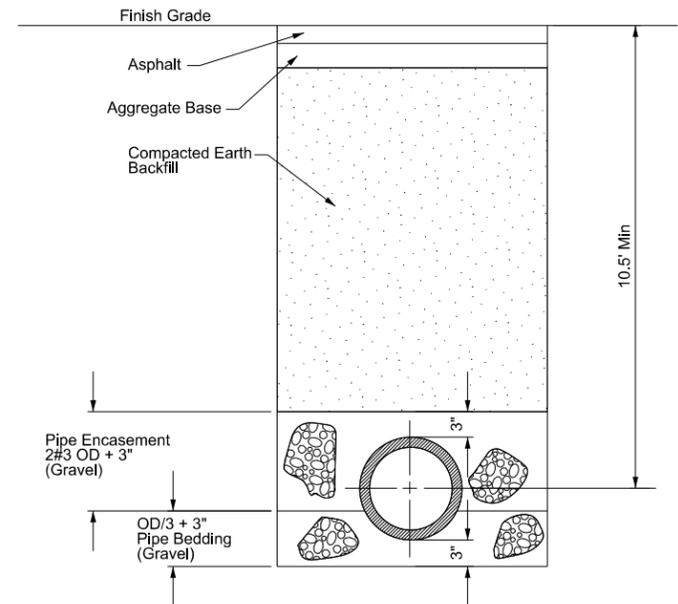
Manhole Details

Williston City 11th Street
New Utilities

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WATER TRENCH BACKFILL



SEWER TRENCH BACKFILL

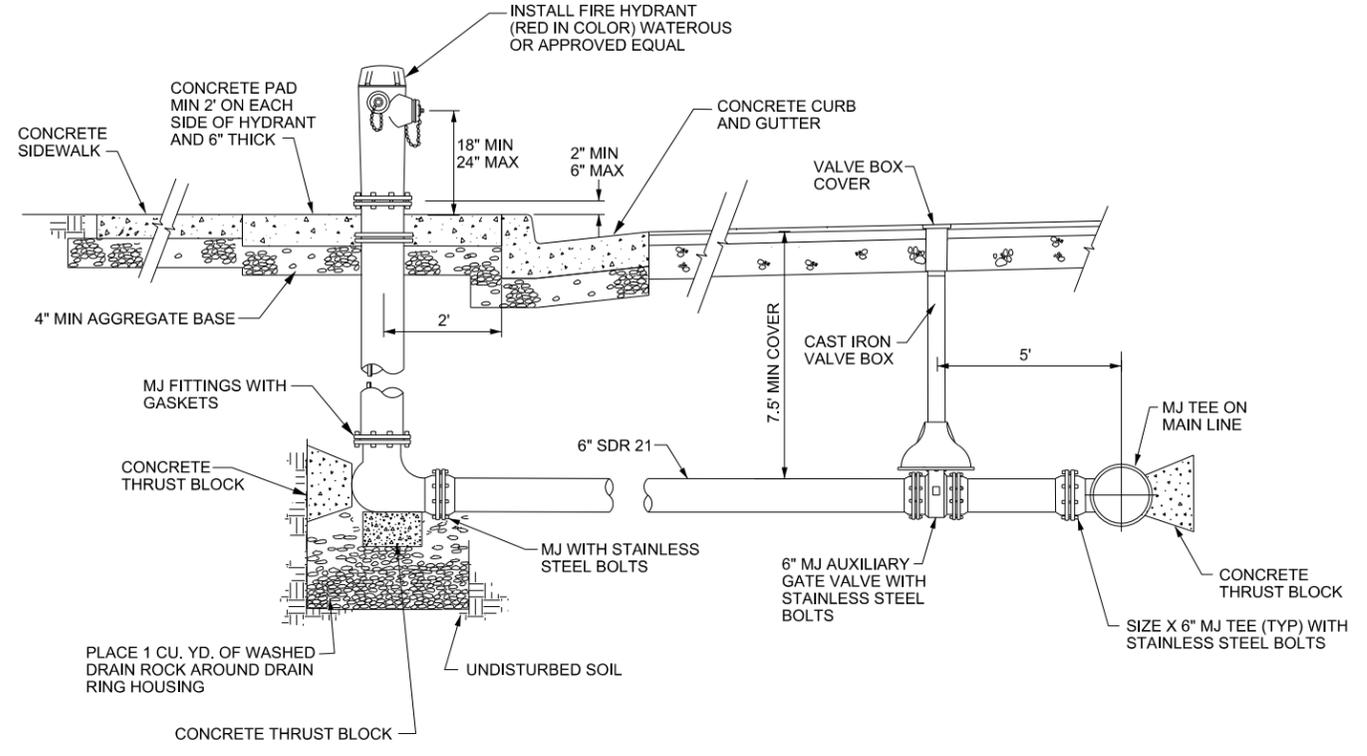

City of WILLISTON
 TYPICAL DETAIL
TRENCH DETAILS

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Trench Details

 Williston City 11th Street
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- NOTES:
1. ALL BURIED FITTINGS AND BOLTS TO BE MECHANICAL JOINT AND STAINLESS STEEL AND TO BE FREE FROM CONCRETE AND FULLY ACCESSIBLE.
 2. HYDRANT SHALL BE INSTALLED 2' BEHIND THE WALK WITH CONCRETE PAD WHEN THERE IS NO PLANTER.
 3. WHEN INSTALLING CONCRETE PAD AROUND FIRE HYDRANT CONTRACTOR SHALL PLACE CRACK CONTROL JOINTS DIAGONALLY FROM THE HYDRANT TO THE CORNERS OF SAID PAD.
 4. A THREE (3) FOOT HORIZONTAL CLEARANCE MUST BE MAINTAINED AROUND THE OUTSIDE OF ALL FIRE HYDRANTS.
 5. EXISTING FIRE HYDRANTS AND FEED LINES ARE TO BE REMOVED. (HYDRANT HEADS WILL BE RETAINED BY THE CITY).

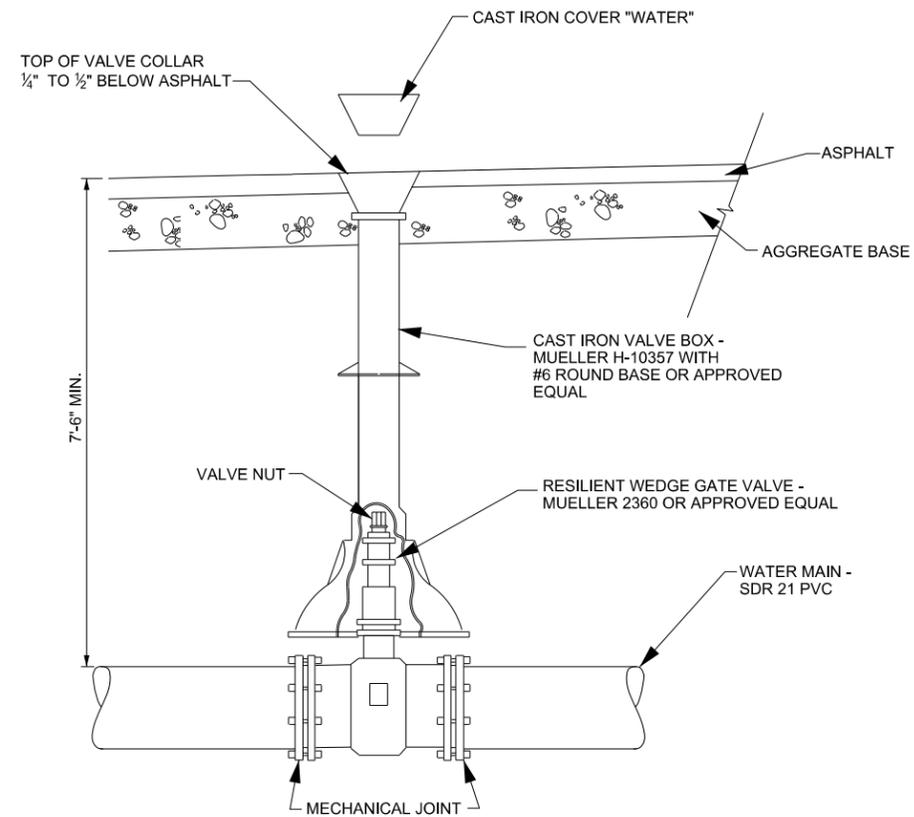


TYPICAL DETAIL
**FIRE HYDRANT DETAIL
(PLANTER)**

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Fire Hydrant Detail (Planter)
 Williston City 11th Street
 New Utilities

| | | | | |
|--|-------|-------------------|-------------|-----------|
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NOTES:

1. TOP OF VALVE COLLAR SHALL BE SET TO FINAL GRADE PRIOR TO PAVING.
2. IN NON PAVED AND PLANTER STRIP AREA, A 4' x 4' x 12" THICK CONCRETE PAD MUST BE PROVIDED FLUSH WITH THE TOP OF THE VALVE BOX.
3. ALL BURIED BOLTS TO BE STAINLESS STEEL AND FREE OF CONCRETE.



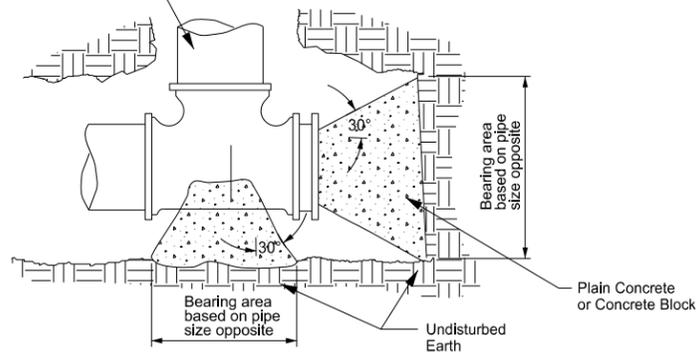
TYPICAL DETAIL
TYPICAL VALVE BOX

W-2

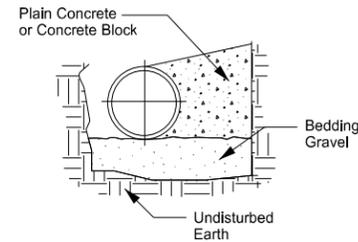
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Typical Valve Box
 Williston City 11th Street
 New Utilities

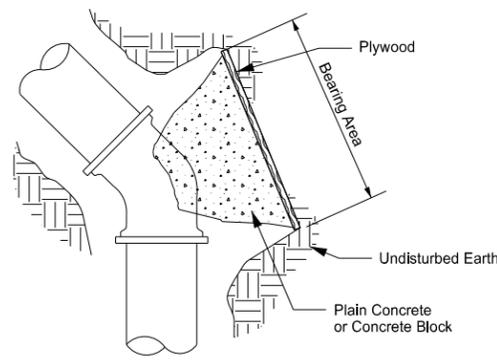
No blocking necessary at this point when branch is plugged (mechanical joint plug only)



Notes:
Tee & plug blocking shown; tapping sleeve blocking similar



| Table of Required Bearing Areas | | | | | |
|---------------------------------|----------|----------|------------|-------------|-------------------------------|
| Size of Pipe | 90° Bend | 45° Bend | 22.5° Bend | 11.25° Bend | Tees, Plugs & Tapping Sleeves |
| 4" | 2' Sq | 2' Sq | 2' Sq | 2' Sq | 2' Sq |
| 6" | 3' Sq | 2' Sq | 2' Sq | 2' Sq | 3' Sq |
| 8" | 5' Sq | 3' Sq | 2' Sq | 2' Sq | 4' Sq |
| 10" | 8' Sq | 4' Sq | 3' Sq | 2' Sq | 6' Sq |
| 12" | 11' Sq | 6' Sq | 3' Sq | 2' Sq | 8' Sq |
| 16" | 20' Sq | 11' Sq | 6' Sq | 4' Sq | 15' Sq |
| 18" | 25' Sq | 14' Sq | 7' Sq | 4' Sq | 18' Sq |



Notes:
1. Concrete blocking to be poured against undisturbed earth and plywood. Keep bells and bolts free of concrete. Concrete in place to be included in price bid for water main.
2. If approved by the Engineer, solid concrete blocks may be used for blocking on 8" Dia. pipe and below. 10" Dia. pipe and above will conform to concrete poured in place areas as shown above.

DERIVED FROM NORTH DAKOTA STANDARDS



TYPICAL DETAIL
THRUST BLOCKS

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Thrust Blocks

Williston City 11th Street
New Utilities