

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	CPU-7-993(050)057	21707	1	1

JOB # 42 NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

CPU-7-993(050)057

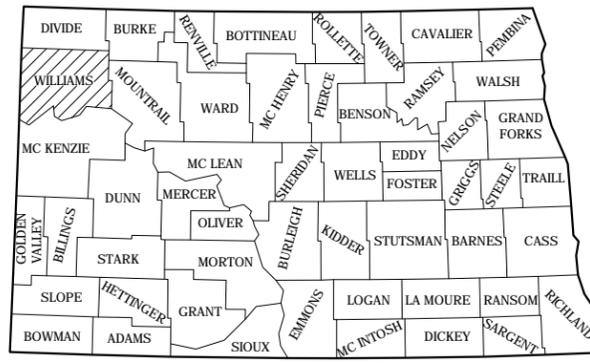
WILLIAMS COUNTY
CITY OF WILLISTON

NEW UTILITIES

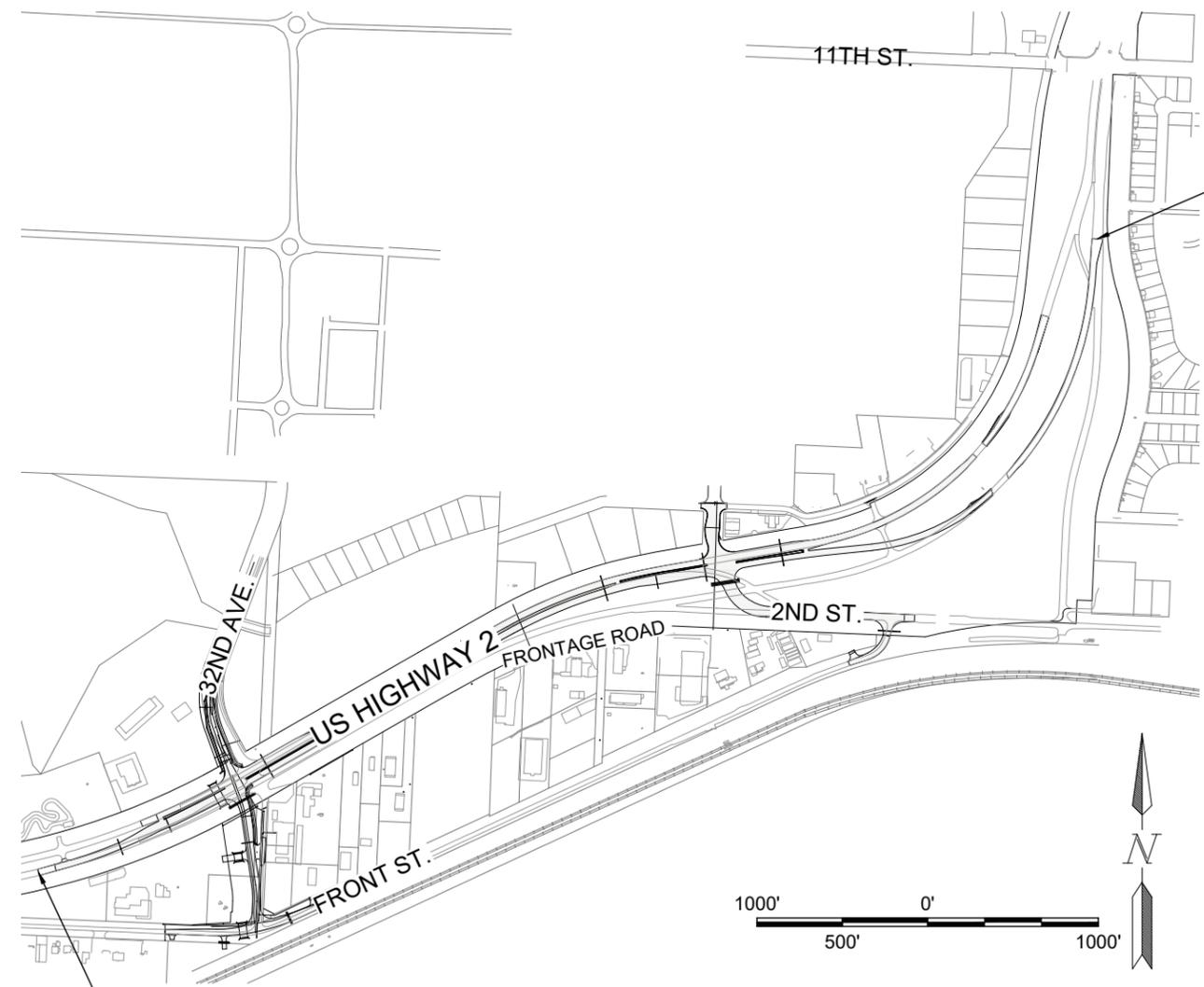
GOVERNING SPECIFICATIONS:

WILLISTON CITY STANDARD SPECIFICATIONS

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
CPU-7-993(050)057	1.407	1.407

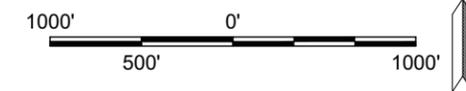


STATE COUNTY MAP



END PROJECT
STA 984+66.27
RP 18.654

BEGIN PROJECT
STA 907+46
RP 17.186



NOTE: ALL STATIONING AND ALIGNMENTS
ARE BASED ON TIED PROJECT
S01B-S01A-7-002(157)017, UNLESS
OTHERWISE NOTED.

DESIGNERS
JUSTIN JONES /s/
KENNETH KNIGHT /s/
TODD KITCHEN /s/

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 11/15/16

ANDREW KITCHEN /s/
CIVIL SCIENCE, INC.

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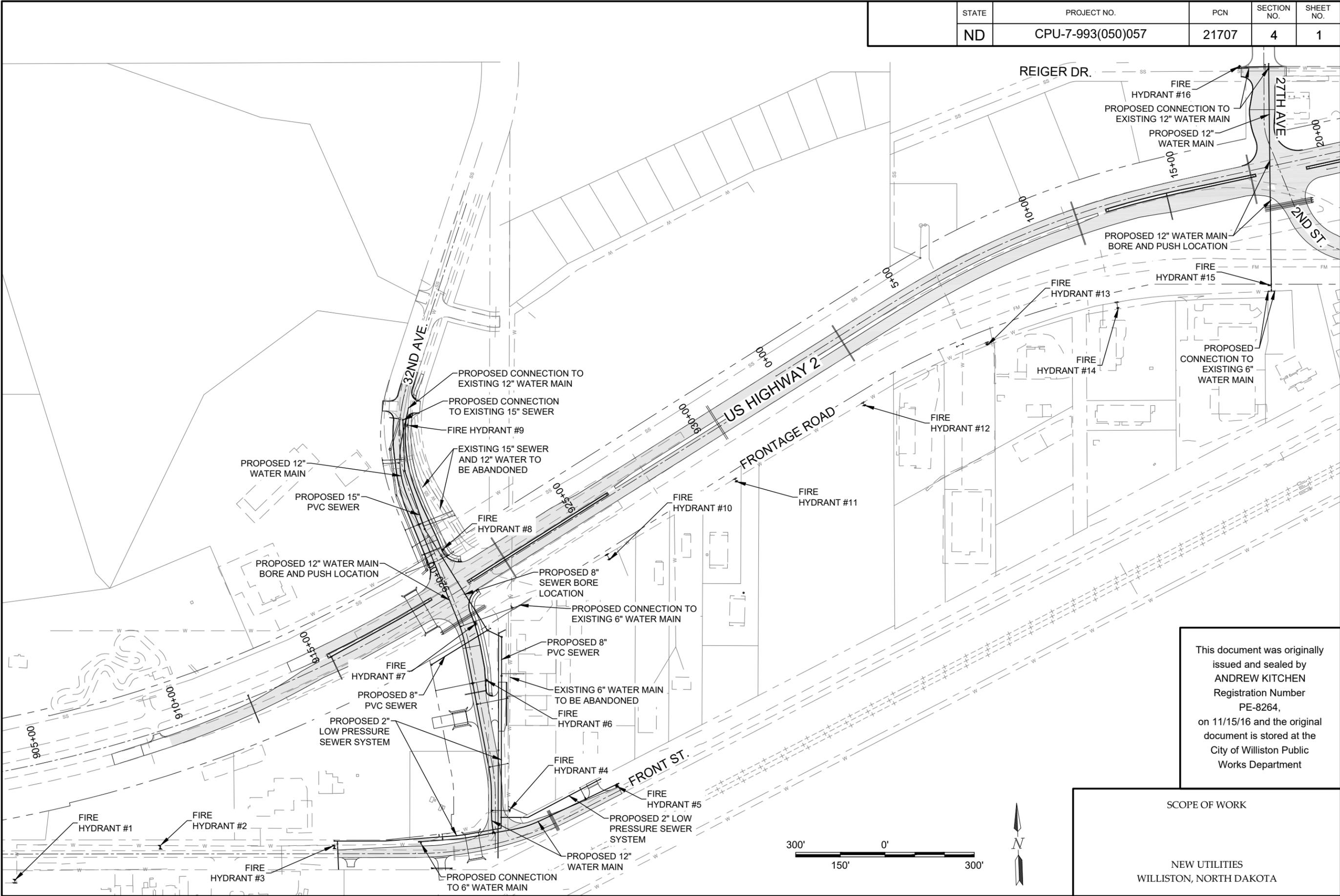
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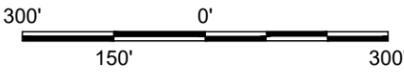
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SCOPE OF WORK
NEW UTILITIES
WILLISTON, NORTH DAKOTA



NOTES

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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(050)057 City Utilities- 32nd Ave., Front St. & 2nd St., is a tied project and shall be completed prior to the roadway construction of the tied project, Project No. SOIB-SOIA-7-002(157)017 US-2 from 32nd Ave. to 11th St. PCC Reconstruction, HBP Reconstruction, Storm Drains, Box Culverts, Traffic Signals and Lighting.

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 7 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 City of Williston. A maximum 8 hour shut-down period is allowed after receiving approval in writing from the City of Williston 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.

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 owners 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.

202-P01 REMOVAL OF PIPES: Unless otherwise specified, all salvageable material shall become the property of the Contractor. All material removed from the site must be disposed of properly. Where indicated on the plans, pipes shall be completely removed and excavations backfilled per City of Williston Specification Section 304.

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. Project No. SOIB-SOIA-7-002(157)017 US-2 from 32nd Ave. to 11th St. PCC Reconstruction, HBP Reconstruction, Storm Drains, Box Culverts, Traffic Signals, Lighting, Pavement Markings and Incidentals.

722-P01 SANITARY SEWER MANHOLES: Sanitary sewer manholes shall be compliant with the following:

- A. Description: This item shall consist of manholes and inlets, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the Engineer.
- B. Materials:
 1. Mortar: Mortar shall be a compound of one part Portland cement to two parts of sand by volume to which lime may be added not to exceed 10% of the cement by weight.
 2. Precast Reinforced Concrete Pipe Manholes: Precast reinforced concrete manhole risers and top sections inlets and catch basins shall conform to A.S.T.M. C478, Wall B. The dimensions of the manholes shall be as shown on the Standard Details of Plans. Snap-in boots or cast-in place gaskets may be provided in lieu of knockouts. Unless otherwise called for, manhole top sections shall be eccentric.
 3. Manhole Steps: Manhole steps shall be cast iron or steel reinforced polyurethane. Cast iron steps shall be Clow F-3650, Vestal Model No. 920-V or approved equal. Steel reinforced polyurethane steps shall be certified to exceed OSHA standards and shall be subject to approval by the Engineer. If, during construction, the polyurethane is damaged to expose the reinforcing steel, the entire step shall be replaced at the Contractor's expense.

4. Manhole Castings and Covers: Manhole frames shall be equal to Neenah Foundry No. R1733. All horizontal bearing surfaces shall be machined. Manhole covers shall be equal to Neenah Foundry Type 'C' lids with two open pick holes.
5. Frost Proof Manhole Castings and Covers: Frost proof manhole frames shall be equal to Neenah Foundry No. R1758-F. All horizontal bearing surfaces shall be machined. Frost proof covers shall be equal to Neenah Foundry Type 'C' lid with two concealed pick holes. The dust pan shall be filled with blanket insulation for a frost proof installation.
6. Inlet Castings and Grates: Inlet castings and grates shall be as follows:
 - a. Type I inlets shall be Neenah Foundry R-3030 or East Jordan Iron Works 7010. Type I inlets shall be provided with diagonal grates.
 - b. Type II inlets shall be Neenah Foundry R-3030 or East Jordan Iron Works 7030. Type II Inlets shall be provided with diagonal grates.
7. Precast Reinforced Concrete Bases: Precast reinforced bases shall conform to the requirements of ASTM C478. Bases may be integrally cast with the bottom section of the riser.
8. Precast Reinforced Concrete Covers: Precast reinforced concrete covers shall conform to the requirements of ASTM C478. Covers shall be designed to withstand AASHTO HS-20 highway loads. Covers will be cast to provide an access hole providing a minimum of 24 inch clear opening. Where necessary, the access hole shall be offset to provide direct access to the manhole steps.
9. Joint Seal: Precast manhole joints shall be sealed with material equal to Kent Seal # 2.
10. Manhole interior coating:
 - a. Manhole interior coating shall meet the requirements of one of the following coating systems:
 - I. Solvent Free 100% solids, ultra-high build epoxy based coating system.
 - II. 100% solids-VOC free polyurethane coating system.
 - III. Multi-layer polymer resin based lining system.
 - IV. Aggregate-filled epoxy based lining system.
 - b. Surfaces shall be prepared and filled and coating material shall be prepared and applied according to manufacturer's directions.
 - c. Manholes with interior coating applied at manufacturing plant where the coating is chipped or damaged during installation shall have the damaged area repaired with the same coating material.

C. Construction Requirements:

1. Excavation: Excavation for catch basins, manholes, inlets and pipe junctions shall be done in a manner to provide adequate room for the construction of the item according to details shown on the plans. When necessary the excavation shall be adequately shored or sheeted to insure safe and satisfactory construction and backfilling. The bottom of the excavation shall be leveled, prepared, and compacted in such a manner as to provide a firm foundation for the base.
2. Precast Reinforced Concrete Pipe Manholes and Inlets: Unless otherwise specified, standard reinforced concrete sewer pipe shall be used for this purpose. When this type of construction is used, the bottom precast section shall be set in a full mortar bed and the joints between sections and around pipes shall be filled with mortar.
3. Concrete Base: The bottoms of all manholes and inlets shall be of concrete. The thickness and other dimensions of the base shall be as specified on the plans. The invert channel shall be the true shape of the lower half of the pipe or sewer. Pipe placed in concrete for inlet or outlet connections shall extend through the walls a sufficient distance to allow for connections and the concrete shall be carefully constructed around them so as to prevent leakage along their outer surface. The inside ends shall be flush with the inside walls, and the pipe shall be of the same size and kinds as those with which they connect on the outside.
4. Placing Castings: Castings shall be set in full mortar beds. Castings shall be set accurately to correct elevation so that no subsequent adjustment will be needed. The maximum distance from the top of the precast reinforced concrete pipe manhole to the top of the casting shall be 12 feet. Building up shall be done with precast manhole rings.
5. Backfill: Backfill shall be deposited in horizontal layers not over 12 inches in depth (loose) and each layer compacted, this process being repeated to the elevation of the finished grade as designated on the plans. Compaction shall be secured by watering each layer if dry (the water content of the material used shall not exceed the optimum moisture content) and tamping with approved mechanical rammers. The backfill shall be compacted to a density equal to the requirements specified for the pipe trench common to the manhole, catch basin, or inlet.
6. Cleaning: All manholes, catch basins, or inlets shall be thoroughly cleaned of any accumulations of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of the final inspection.

722-P02 SANITARY SEWER TESTING: Sanitary sewer testing shall be compliant with the following:

- A. Leakage Testing for Non-Pressure Piping: All gravity sewers 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

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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, 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 that 1/2 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 1118 15IN SANITARY SEWER PIPE and 724 1095 BORE SANITARY SEWER PIPE Bid Items.

722-P03 ABANDON SEWER MANHOLE: Abandoning sewer manholes shall include the features, materials, installation procedures, and be compliant with the following:

- A. As a minimum the manhole frame and cover, grade rings or other manhole adjustment material, and cone or flat slab lid shall be removed and disposed of by Contractor.
- B. An expansion type "Brandt" plug shall be inserted inside all connecting pipes.
- C. The manhole shall then be filled with cement treated fill or compacted granular fill.
- D. Alternatively the entire manhole, including base and wall sections may be removed and disposed of by Contractor and the excavated area backfilled with compacted granular fill.

722-P04 MANHOLE SPECIAL: Special low pressure sewer system manholes include a Dead End Low Pressure Flushing Connection, Low Pressure Junction, and a Pressure Line Connection to Manhole. Construct these manholes per details provided in Section 20 of the plans and per part 724-P12 SANITARY SEWER LOW PRESSURE SYSTEM of these notes.

724-P01 BORE SANITARY SEWER

PART 1: 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 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 724-P01 Part 1 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

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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. 302-Removals
 - b. 303-Excavation and Embankment
 - c. 304-Trench Excavation
 - d. 305-Topsoil
 - e. 306-Seeding, Sodding, and Mulching
 - f. 401-Water Main Construction
 - g. 402-Water Service Connections
 - h. 403-Cleaning and Disinfection
 - i. 404-Pressure and Leak Testing
 - j. 501-Sanitary Sewers
 - k. 502-Sanitary Sewer Services
 - l. 504-Manholes and Inlets
 - m. 505-Force Main Construction
 - n. 508-Castings and Adjustment
2. NDDOT Standard Drawings and Specifications

PART 2: PRODUCTS - Jack and bore products shall be compliant with the following:

A. PIPE CASING

1. All costs associated with the construction of the 16 Inch steel pipe casing shall be paid as 724 1095 BORE SANITARY SEWER PIPE bid item.
2. Steel pipe casings shall conform to the requirements of ASTM A36 (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 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. 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. CASING SPACERS

Casing spacers shall meet one of the following requirements:

1. Type I casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing.
2. Type II casing spacers shall be a two-section, flanged, bolt on style constructed of heat fused PVC coated steel, minimum 14 gauge band and 10 gauge risers, with 2-inch wide glass reinforced polyester insulating skids, heavy duty PVC inner liner, minimum 0.09-inch thick having a hardness of 85-90 durometer, and all stainless steel or cadmium plated hardware

D. 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.

PART 3: 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.

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.
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 724-P01 Part E Line 4 are maintained throughout bore alignment.
6. 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.

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. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots.
2. 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.
3. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of 1-inch. Provide a minimum of two casing spacers per joint of pipe or 20' of pipe. Spacers may be omitted for fused pipe if line and grade can be achieved.

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.

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724-P02 WATERMAIN BORE AND PUSH

PART 1: 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 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 724-P02 Part 2 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. 302-Removals
 - b. 303-Excavation and Embankment
 - c. 304-Trench Excavation
 - d. 305-Topsoil
 - e. 306-Seeding, Sodding, and Mulching
 - f. 401-Water Main Construction
 - g. 402-Water Service Connections
 - h. 403-Cleaning and Disinfection
 - i. 404-Pressure and Leak Testing
 - j. 501-Sanitary Sewers
 - k. 502-Sanitary Sewer Services
 - l. 504-Manholes and Inlets
 - m. 505-Force Main Construction
 - n. 508-Castings and Adjustment
2. NDDOT Standard Drawings and Specifications

PART 2: PRODUCTS - Jack and bore products shall be compliant with the following:

A. PIPE CASING

1. All costs associated with the construction of the 20 Inch steel pipe casing shall be paid as 724 0851 BORE & PUSH 12IN PVC WATER bid item.
2. Steel pipe casings shall conform to the requirements of ASTM A36 (straight seam pipe only), Grade "B" with a minimum yield strength of 35,000 psi and be of a minimum thickness of 0.312 inches. 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 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. 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.

E. CARRIER PIPE

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

F. CASING SPACERS

- Casing spacers shall meet one of the following requirements:
3. Type I casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing.
 4. Type II casing spacers shall be a two-section, flanged, bolt on style constructed of heat fused PVC coated steel, minimum 14 gauge band and 10 gauge risers, with 2-inch wide glass reinforced polyester insulating skids, heavy duty PVC inner liner, minimum 0.09-inch thick having a hardness of 85-90 durometer, and all stainless steel or cadmium plated hardware

G. AUGERING FLUIDS

2. 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.

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PART 3: 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.

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.
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 or minimum bury depths 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 in Note 724-P02 Part E Line 4 are maintained throughout bore alignment.
6. 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.

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. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots.
2. 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.
3. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of 1-inch. Provide a minimum of two casing spacers per joint of pipe or 20' of pipe. Spacers may be omitted for fused pipe if line and grade can be achieved.

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.

724-P03 FUSIBLE POLYVINYLCHLORIDE PIPE GENERAL: Fusible polyvinylchloride pipe shall be paid as 724 0851 WATERMAIN and 724 1095 BORE SANITARY SEWER PIPE Bid Items 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.)
Fusible C-900	12	DR-18	BLUE	200	11.47	12.75
FPVC	8	SDR-26	GREEN	160	7.92	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.

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.

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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.

C. PRODUCTS: Fusible polyvinylchloride pipe products shall include the features, installation procedures, and be compliant with the following:

1. FUSIBLE POLYVINYLCHLORIDE PRESSURE PIPE FOR POTABLE WATER.

- a. 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.
- b. 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.
- c. Fusible polyvinylchloride pipe shall be manufactured in a standard 40-foot nominal length, or custom lengths as specified.
- d. Fusible polyvinylchloride pipe shall be blue in color for potable water use.
- e. Pipe shall be marked as follows:
 - I. Nominal pipe size
 - II. PVC
 - III. Dimension Ratio
 - IV. AWWA pressure class
 - V. AWWA standard designation number
 - VI. NSF-61 mark verifying suitability for potable water service
 - VII. Extrusion production-record code
 - VIII. Trademark or trade name
 - IX. Cell Classification 12454 and/or PVC material code 1120 may also be included
- f. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

2. FUSION JOINTS

- a. 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.

3. CONNECTIONS AND FITTINGS

a. DUCTILE IRON MECHANICAL FITTINGS

- I. 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.
- II. Connections to fusible polyvinylchloride pipe shall be made using MJ fittings.
- III. 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.
- IV. Ductile iron fittings and glands must be installed per the manufacturer's guidelines.

b. SLEEVE-TYPE COUPLINGS

- I. 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.
- II. Sleeve-type couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

c. EXPANSION AND FLEXIBLE COUPLINGS

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

d. CONNECTION HARDWARE

- I. 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.

D. FUSIBLE POLYVINYLCHLORIDE PIPE EXECUTION: Fusible polyvinylchloride pipe execution shall be compliant with the following:

1. DELIVERY AND OFF-LOADING

- a. All pipes 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.
- b. 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.
- c. 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.
- d. 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.
- e. During removal and handling, the pipe shall not strike anything. Significant impact could cause damage, particularly during cold weather.
- f. 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.

2. HANDLING AND STORAGE

- a. 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.
- b. 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.
- c. 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 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.
- d. 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.
- e. 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.
- f. Pipe shall be stored and stacked per the pipe supplier's guidelines.

3. FUSION PROCESS

a. GENERAL

- I. 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.
- II. Fusible polyvinylchloride pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.
- III. 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:
 1. 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.

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- 2. 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.
- 3. GENERAL MACHINE - Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.
- 4. 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.
- IV. Other equipment specifically required for the fusion process shall include the following:
 - 1. Pipe rollers shall be used for support of pipe to either side of the machine
 - 2. 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.
 - 3. An infrared (IR) pyrometer for checking pipe and heat plate temperatures.
 - 4. Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.
 - 5. Facing blades specifically designed for cutting fusible polyvinylchloride pipe shall be used.
- b. 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.
- 4. DRILLING OPERATIONS
 - a. GENERAL
 - I. 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.
 - b. LOCATION AND PROTECTION OF UNDERGROUND UTILITIES
 - I. 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.
 - II. Utility location and notification services shall be contacted by the Contractor prior to the start of construction.
 - III. All existing lines and underground utilities shall be positively identified, including 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.
 - c. SITE LOCATION PREPARATION
 - I. 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
 - d. DRILLING LAYOUT AND TOLERANCES
 - I. 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.
 - II. 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.
 - III. Entry and exit areas shall be drilled so as not to exceed the bending limitations of the pipe as recommended by the pipe supplier.
- 5. PIPE PULL-BACK AND INSERTION
 - a. Pipe shall be fused prior to insertion into one continuous length.
 - b. 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.
 - c. The pipe entry area shall be graded as needed to provide support for the pipe and to allow free movement into the bore hole.
 - I. The pipe shall be guided into the bore hole to avoid deformation of, or damage to, the pipe.
 - II. 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.

- III. A swivel shall be used between the reaming head and the fusible polyvinylchloride pipe to minimize torsion stress on the pipe assembly.
 - d. 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.
 - e. Once pull-back operations have commenced, the operation shall continue without interruption until the pipe is completely pulled through the casing.
 - 6. INSTALLATION CLEANUP
 - a. 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.
 - b. Contractor shall verify that all utilities, structures, and surface features in the project area are sound.
- 724-P04 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 and 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 724-P03)
 - 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 Class 20 SDR 21 pressure pipe.
 - 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:
 - A. 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.
 - V. Covers marked "Water".
 - VI. Top Section 25.5 inches long. Center Section 60 inches long.
 - VII. Extension pieces as required, Mueller No. H-10363 or equal.
 - VIII. 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: Hydrants shall be Waterous Pacer WB67-250 with extended head and 22 inch break off. Hydrants shall be provided

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- with two 2½ inch ID hose connections with 7352 Threads and one 4 inch ID pumper connection with 40500 Threads. Hydrants shall have mechanical joint connections with stainless steel nuts and bolts. All hydrants with 6 inch pipe connections shall have 5 inch valves, hydrants with 8 inch connections shall have 6 inch valves. The minimum bury depth shall be 7 1/2 feet. The traffic flange bolts shall be located 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 36 inches square.
- i. Insulation: Waterline Insulation shall meet the standards of note 744-P01 POLYSTYRENE INSULATION BOARD.
 - j. Identification Marker Tape Provide metallic core tape, blue with black letters "CAUTION - WATER 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:
 1. Seton Name Plate Corp.
 2. Reef Industries, Inc.
 3. Pro-Line Safety Products Co.
 - k. Tracer Wire: Tracer wire shall be Type THHN, AWG size #12, UL listed with a single copper conductor, PVC insulation, and nylon jacket.
 - l. Tracer Wire Test Stations: Test stations shall be CP Test Services, Glenn Series, Glenn-4 with locking lid, 4" I.D., or approved substitution.
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. Sanitary Sewer Horizontal Separation: A minimum of 10 feet horizontal clearance shall be maintained between the outside wall of any sewer line and the outside wall of any waterline.
 - f. 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.
 - g. Insulation: Waterline Insulation shall meet the standards of note 744-P01 POLYSTYRENE INSULATION BOARD and be paid as part of the 744-0100 POLYSTYRENE INSULATION BOARD Bid Item.

- h. Identification Marker Tape Install identification marker tape in backfill area of trench above all water lines, 18' to 24' below finished grade.
- i. Tracer Wire: Install continuous tracer wire attached to top of pipe.
- j. Tracer Wire Test Stations Install test stations at all fire hydrants and every 400 LF of water line.
- k. Contractor shall verify the horizontal and vertical location of existing waterlines within roadway intersections prior to installation of new waterline.
- l. All existing valves shall only be operated by authorized City of Williston employees.
- m. Subsequent to activation of new water system, remove top box sections from all existing water valves to be abandoned in place.
- n. Pavement Repair: Any pavement disturbed by installation of water lines shall be replaced with a similar section or meet the minimums listed below:
Asphalt Pavement: 5.5IN Superpave FAA 45 PG 64-28 over 15 inches Base Course
Concrete Pavement: 9IN Non-Reinf Concrete PVTM CL AE-Doweled over 8 inches Base Course
- o. Temporary Bypass Piping: All water services and hydrants must remain in service during construction. Contractor to provide bypass piping where needed.

I. DESCRIPTION

Work consists of the installation of a temporary bypass water system as required in the Contract Documents and as directed by the City.

Work is to be in conformance with the all other watermain requirements in the Contract Documents.

II. MATERIALS

1. General

All materials furnished for use as temporary bypass pipe, service hose, connections and related appurtenances that come into contact with drinking water are to be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61) by an American National Standards Institute (ANSI) approved third-party certification program or laboratory. All materials shall be fully adequate to withstand the required water pressure and all other conditions of use, and shall provide adequate water tightness before being put into service.

Temporary bypass pipe must be drawn from water main equipment stocks that are dedicated exclusively for use in pipe projects involving fresh potable water.

Temporary bypass pipe shall be PVC or steel having a minimum working pressure rating of 200 pounds per square inch with restrained couplings.

Water service hose to be used for connection from the temporary bypass pipe to the building/residence shall have a minimum working pressure rating of 200 pounds per square inch and be made of a material that will not have an adverse effect on the taste or odor of the water.

2. Bulkhead (Temporary Line Cap): Bulkhead (temporary line cap) shall consist of a bolted sleeve type pipe coupling with steel end cap capable of sliding over the cut end of the water main pipe.

3. Temporary Fire Hydrant: Temporary fire hydrant shall consist of a 4 inch by 4 inch tee or 4 inch 90° bend, with a butterfly valve connected to the end of the tee or bend, and an operating nut to control the valve. Temporary fire hydrant shall be equipped with a 4 inch ID pumper connection with 40500 threaded nozzle with hydrant cap installed.

III. CONSTRUCTION DETAILS

1. General

a. One week prior to bypass work, the Contractor shall deliver "door hanger" notices to each affected residence and business.

b. Temporary bypass system shall include temporary bypass pipe, hoses, connections and related appurtenances necessary to maintain a continuous supply of water. Temporary bypass system shall be maintained in a safe and operative condition at all times.

c. For protection of the work and the public, flashers and barricades shall be installed at locations as directed by the City. The flashers and barricades shall be maintained in proper operating condition.

d. Where required, the Contractor shall install bulkheads (temporary line caps) on the existing water main to keep the section of the existing water main pressurized and capable of supplying a continuous flow of water. The bulkheads shall be fitted with a bolted sleeve type pipe coupling having a steel end cap and outlet fitting so that the temporary bypass pipe can be fed through the end of the bulkhead. The coupling shall be slid over the end of the water main, and braced or restrained so that it will support normal operating line pressure.

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- e. To prevent contamination, open cut water main ends that are left unattended shall be wrapped by a double layer of polyethylene plastic and tightly tied or covered with a water tight plug. All fire hydrant nozzles shall be capped when not in use.
 - f. Valves shall be installed on the temporary bypass pipe at all appropriate locations, valve spacing should generally not exceed 800 feet.
 - g. Temporary bypass pipe crossing streets and sidewalk access ramps shall be installed in a trench and shall not block or otherwise impede access to any sidewalk access ramp. The existing pavement shall be saw cut and excavated to a depth sufficient to contain the temporary bypass pipe. The Contractor shall maintain uninterrupted accessibility to sidewalk access ramps at all times.
 - h. Temporary bypass pipe in other areas may also be required to be installed in a trench as required in the Contract Documents and as directed by the City.
 - i. To minimize interference with vehicle and pedestrian traffic, whenever temporary bypass pipe crosses a driveway or sidewalk, the temporary bypass pipe shall be covered with a mound of high performance asphalt material, or suitable ramps.
 - j. After completion of the water main work and restoration of the supply of water back to the water main, the Contractor shall remove all temporary bypass pipe and related appurtenances. The street, sidewalks and adjacent property shall be restored to a neat and orderly condition.
2. Disinfection
- a. All bypass pipes shall be disinfected per the requirements of 724-P07 of these notes, the North Dakota Health Department and the Contract Documents.
 - b. The Contractor shall disinfect the hydrant standpipe prior to connecting the bypass pipe to the hydrant by pouring 1 quart of commercially available bleach (solution containing approximately 5% sodium hypochlorite) into the hydrant. The hydrant shall be filled with clean water and let stand for a minimum of 20 minutes. The hydrant shall then be flushed and the bypass pipe connected to it.
3. Temporary Water Service Connection and Restoration of Service
- a. The Contractor shall make all connections to the customer's water service line on a day and at a time that is convenient to the customer.
 - b. Connection from the temporary bypass pipe to the water service line shall be made inside the building at the meter, outside at the hose bib, or any suitable area not directly in the street.
 - c. The Contractor shall excavate, expose and cut the water service line, and connect the hose. The Contractor shall either backfill excavated area or install orange construction fencing with flashers around the excavated area. If the area where the excavation is made is paved, the Contractor shall cover the excavation with heavy gauge steel plates capable of supporting an AASHTO H20 Highway Loading.
 - d. The Contractor shall make satisfactory arrangements with the customer so that stop and waste valves shall be accessible at all times.
 - e. After completion of the water main work, the Contractor shall clear the water service lines by back flushing with potable water. The Contractor shall disconnect the hose, restore the water service line back to normal conditions, and restore water flow. Access points shall be properly restored to pre-construction status.
 - f. When temporary bypass is used during a water main cleaning and lining project, and the situation arises where a building is boarded-up and arrangements cannot be made to backflush the building's water service after the water main has been lined, the City may direct the Contractor to excavate the service at the location where the service is connected to the water main, disconnect the service and clean out any cement mortar that may have accumulated in the service at this location. Once cleaned out, the service shall be reconnected to the water main, the excavation backfilled and the surface restored.
4. Temporary Fire Hydrants
- Temporary fire hydrants shall be installed where indicated on the plans or as directed by the City. Temporary fire hydrants shall be required on temporary bypass pipe which is 4 inch in diameter or larger in size. The pipe threads shall be protected with a hydrant cap when not in use. Temporary fire hydrants shall be serviceable at all times. Hydrants are subject to inspection at any time by either the City of Williston Fire Department. If they are found to be unserviceable, immediate correction shall be made.

724-P05 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-P06 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.
 - 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:

$$Q = \text{Allowable leakage rate in gallons per hour}$$

$$D = \text{Nominal diameter of pipe in inches}$$

$$L = \text{Length of section tested in thousand feet}$$

$$N = \text{Square root of weighted average test pressure in psi}$$

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- 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-P07 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.
 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-P08 ABANDON WATERLINE: Cut, cap and plug ends of abandoned waterline with concrete.

724-P09 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: Waterline Insulation shall meet the standards of note 744-P01 POLYSTYRENE INSULATION BOARD.
 6. 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. General: Sanitary sewer service connections shall be constructed in accordance to the specifications regarding Sanitary Sewer main construction contained in Note 724-P10.
 - 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.
 - b. Provide sewer cleanouts at 100 foot maximum spacing along services per detail sheets.
 2. Insulation: Waterline Insulation shall meet the standards of note 744-P01 POLYSTYRENE INSULATION BOARD and be paid as part of the 744-0100 POLYSTYRENE INSULATION BOARD Bid Item.
 3. Pavement Repair: Any pavement disturbed by installation of water lines shall be replaced with a similar section or meet the minimums listed below:
 - Asphalt Pavement: 5.5IN Superpave FAA 45 PG 64-28 over 15 inches Base Course

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- Concrete Pavement: 9IN Non-Reinf Concrete PVMT CL AE-Doweled over 8 inches Base Course
4. Sewer Holding Tank Abandonment: Existing sewer holding tanks shall be abandoned in place during sewer lateral work and shall be considered incidental to the lateral installation. The Contractor shall:
 - a. Pump all tanks. A licenced liquid waste hauler shall pump the holding tanks capable of holding sewage. Tanks shall be cleaned prior to abandonment to avoid leaching of sewage into ground.
 - b. Disconnect the piping. The following piping shall be disconnected:
 - I. The piping between the building and the holding tank and
 - II. The piping between the holding tanks.
 - c. Punch 6 inch hole in the base of each tank prior to backfilling.
 - d. Fill in the holding tanks and all other chambers. Tanks shall be filled in with clean fill material, sand or gravel.
 - e. Crush and fill all metal holding tanks. Where metal tanks exist as holding tanks, metal tanks shall be crushed in place and filled in with clean fill material, sand or gravel.
 - f. Restrict access for any collapsed tanks. Holding tanks are classified as a confined space. Open and collapsed tanks pose a significant safety hazard to adults, children and pets. The Contractor is responsible for restricting access to open and collapsed tanks by placing a cover material on top of any collapsed tanks and by roping off access to the area. The tank(s) must be filled in with clean fill material, sand or gravel based on the above requirements.
 - g. Abandonment of block or concrete holding tanks. If the sewage disposal system consists of an existing block or concrete holding tank, the following abandonment requirements apply:
 - I. The sewage inside the tanks must be pumped by a licensed liquid waste hauler;
 - II. The concrete lid must be removed and crushed into the tank;
 - III. The block or concrete tank must be filled in with clean fill material, sand or gravel;
 - h. Some tanks consist of concrete well rings that are set on top of another and concreted together. These concrete rings must be removed to a depth of three (3') feet below ground surface, and filled in with clean fill material, sand or gravel.
 5. Coordinate sewer lateral installation and sewer holding tank abandonment with owners of Westside Oil (Conoco gas station) and OK Tire Store. Contractor shall prepare an installation and impact plan for these properties and submit to engineer for approval prior to construction.

724-P10 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. Fusible Polyvinyl Chloride Sewer Pipe: For the sewer bore, fusible PVC may be used. If used, follow Note 724-P03.
4. Rubber Gasket Joints: Rubber type gaskets for PVC non-pressure pipe shall conform to the requirements of ASTM D3212.
5. 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.
6. 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.
7. Insulation: Waterline Insulation shall meet the standards of note 744-P01 POLYSTYRENE INSULATION BOARD.
8. 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. Sewer Bypass Pumping:

- a. Wastewater flows in the existing wastewater system shall be maintained at all times.
- b. Bypass pumping, temporary bypass piping, or other means required to divert wastewater flow around the construction site shall be provided by the Contractor.
- c. Placing a plug and allowing wastewater to back up in existing wastewater lines will not be allowed.
- d. A bypass plan shall be submitted to City of Williston for review and approval prior to the start of construction.
- e. Bypass plans using pumping equipment shall include continuous (24 hr/day) monitoring of the pumping equipment.
- f. Bypass plans using pumping equipment shall include backup or redundant pumping and piping systems, as approved by City of Williston, in the event the primary system fails.
- g. Cost for sewer bypass pumping shall be incidental to 724 1118 15IN SANITARY SEWER PIPE AND 724 1095 BORE SANITARY SEWER PIPE Bid Items.
3. 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.
 - 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.
4. 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.
5. Pipe Laying: Minimum depth of cover required for all sewer mains and laterals is 7-1/2 feet. If this minimum cover cannot be achieved, insulation will be required, see note 724-P10-8 below. 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.
6. Dewatering:
 - a. All excavations shall be dewatered before any construction is undertaken.
 - b. Pipe shall be laid only in dry trenches.
 - c. Concrete shall be placed only on dry, firm foundation material.
 - d. The Contractor shall have adequate dewatering equipment on-site.
 - e. Groundwater shall not be allowed to enter the Public Wastewater System.
7. Pipe Trench Dam:
 - a. Trench dams shall be constructed in sewer main trenches at 100' maximum intervals and in accordance with details as shown on Construction Drawings.
 - b. Additional trench dikes may be required at other locations to prevent migration of ground water along the sewer trench as determined and directed by City of Williston.
7. 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.
8. Insulation: Waterline Insulation shall meet the standards of note 744-P01 POLYSTYRENE INSULATION BOARD and be paid as part of the 744-0100 POLYSTYRENE INSULATION BOARD Bid Item.
9. Pavement Repair: Any pavement disturbed by installation of water lines shall be replaced with a similar section or meet the minimums listed below:

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Asphalt Pavement: 5.5IN Superpave FAA 45 PG 64-28 over 15 inches Base Course
 Concrete Pavement: 9IN Non-Reinf Concrete PVMT CL AE-Doweled over 8 inches Base Course

724-P11 SANITARY SEWER FORCE MAIN: DESCRIPTION This item shall consist of pipe of the types, classes, sizes, and dimensions required on the plans, furnished and installed at the places designated on the plans and profiles, or by the Engineer, in accordance with these specifications and with the lines and grades given. The bid price per linear foot of pipe in place, shall include the cost of excavation and backfill, the cost of furnishing and installing all trench bracing, concrete bases and concrete thrust blocking, and the material for the making of all joints, including all connections to existing force mains.

A. Materials:

1. General The pipe shall be of the type called for on the plans or in the Proposal and shall be in accordance with the following appropriate requirements.
2. Polyvinyl Chloride Pipe Polyvinyl Chloride Pipe, when specified, shall meet the requirements of Class 200 IPS, SDR-21 pressure rate pipe. The pipe material 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 16.
3. High Density Polyethylene Pipe High density polyethylene pipe shall be a PE3408 High Density, High Extra Molecular Weight Polyethylene Pipe conforming to the requirements of ASTM D3350 having a cell classification of PE345434C. Dimensions and workmanship shall conform to the requirements of ASTM F714. HDPE Pipe shall have a minimum of 160 PSI pressure rating and SDR ratio of 7. Unless otherwise specified, HDPE pipe joints shall be butt fused.
4. Ductile Iron Fittings: Fittings shall be Class 250 fittings conforming to AWWA C110. Joints shall be mechanical joint or push on joint conforming to AWWA C111. Fittings shall be epoxy coated in accordance with AWWA C550 and/or AWWA C213. Mechanical joint bolts and nuts shall be stainless steel. Fittings shall be wrapped with polyethylene in accordance with AWWA C105. Unless otherwise specified, PVC fittings will not be accepted.
5. HDPE Flanged Coupling Adapters HDPE flanged coupling adapters shall consist of the following: HDPE molded flange connector meeting the HDPE pipe material specifications, Style "FCA 501" Flanged Coupling Adapter as manufactured by ROMAC or approved equal, complete with stainless steel nuts and bolts, and Ductile iron backup ring. The flanged coupling adapter shall be wrapped in a polyethylene jacket.
6. Gate Valves Gate valves shall be resilient seat gate valves with nonrising 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. Gate valves shall have doubles "0" ring stem seals and 2 inch square operating nuts for key operation. All valves shall open counterclockwise. Gate valves shall be furnished with push on or mechanical joints. Mechanical joint bolts and nuts shall be stainless steel.
7. Valve Boxes The valve boxes furnished shall be of a quality equal to Mueller Company No. H-10357 with a No. 6 round base, center section 60 inches long, top section 25.5 inches long with unmarked covers. Extension pieces shall be of a quality equal to Mueller No. H-10363. 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. If any valve box extension pieces are required to make the above mentioned adjustment, they shall be considered incidental to the price bid for either Butterfly Valve and Box and/or Gate Valve and Box.
8. Air Release Valves The air release valves shall be equal to CRISPIN SL-20 air release valves with a 1/4 inch release orifice. The Valve shall be complete with all fittings required to connect it to the force main and supports necessary to support the valve's weight.
9. Air and Vacuum Release Valves The air and vacuum release valve shall be equal to CRISPIN SL-20A1. The valve shall be complete with all fittings required to connect it to the force main and supports necessary to support the valve's weight.
10. Insulation: Waterline Insulation shall meet the standards of note 744-P01 POLYSTYRENE INSULATION BOARD.

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. Excavations within City street and alley rights of way must be completed by Contractors who have posted a \$10,000 Excavation Performance Bond with the City which warrants their work for a period of two years. Details regarding the Excavation Performance Bond requirements may be obtained from the City Auditor's Office.

1. Equipment: All equipment necessary and required for the proper construction of water mains shall be on the project, in first class working condition and approved by the Engineer before construction is permitted to start. 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. The Contractor shall provide hand tampers and pneumatic tampers to obtain the required compaction of the pipe bed and the backfill, as specified.
2. Tests: The test section shall be filled with water and subjected to examination. After the examination, the pressure shall be gradually increased. If defects are found, the Contractor shall immediately make the necessary repairs at his own expense. The final pressure test shall be 150 PSI and shall be held at least 1 hour. The Contractor shall furnish all tools, equipment and material necessary to make the pressure test.

3. 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 in a manner satisfactory to 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 before installation shall be drained and stored in a manner that will protect them from damage by freezing.
4. Blocking Fittings: All fittings, tees, and bends 22-1/2° and more shall be provided with suitable reaction blocking of concrete blocks of adequate size to prevent movement of fittings when the pipe is under pressure. The blocks shall be placed in a manner acceptable to the Engineer and shall allow pipe and fitting joints to be accessible for repair. The concrete blocks may be poured in place if sufficient time is allowed for curing.
5. Anchor for Valves Wherever a slip on type joint force main is used, all gate valves shall be anchored and tied down with steel and concrete. The anchors and tie downs shall be placed in a manner and of a size according to the manufacturer's recommendations. The size, location and procedure shall be acceptable to the Engineer. The concrete shall be six bag concrete, poured in place with sufficient time allowed for curing. The concrete, steel and labor for anchoring purpose shall be considered incidental to the Price Bid for water main pipe.
6. Marking Valve Box Locations The Contractor will be required to furnish and install a steel fence post by each valve box. Steel fence posts to be used for valve locations shall be a "Tee" or "U" post having a minimum length of 5-1/2 feet. The post shall be located 2 feet from the valve box in a direction toward the street. The cost of the steel fence post and the installations shall be considered incidental to other bid items.
7. Insulation: Waterline Insulation shall meet the standards of note 744-P01 POLYSTYRENE INSULATION BOARD and be paid as part of the 744-0100 POLYSTYRENE INSULATION BOARD Bid Item.
8. Pavement Repair: Any pavement disturbed by installation of water lines shall be replaced with a similar section or meet the minimums listed below:

Asphalt Pavement: 5.5IN Superpave FAA 45 PG 64-28 over 15 inches Base Course
 Concrete Pavement: 9IN Non-Reinf Concrete PVMT CL AE-Doweled over 8 inches Base Course

724-P12 SANITARY SEWER LOW PRESSURE SYSTEM: Sanitary sewer low pressure system shall be compliant with the following:

A. Main Line 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. High Density Polyethylene (HDPE)
 - a. Materials: Virgin resins, Cell Classification meeting or exceeding PE 345434C as defined in ASTM D 3350, resins shall be listed by the Plastic Pipe Institute in its pipe-grade registry TR-4.
 - b. Pipe and Fittings:
 - I. ASTM Material Designation Code: PE 3608/3408 or PE 4710 high density, extra high molecular weight.
 - II. 1 1/4" thru 12" diameters. SDR and Pressure Class shall be based on specific requirements of installation with minimum SDR 11 and Pressure Class 160 in accordance with ASTM F 714.
 - III. Outside diameter to be ductile iron pipe size (DIPS) or iron pipe size (IPS).
 - IV. Marked in accordance with ASTM F 714.
 - V. Pipe shall be manufactured with an integral color coded stripe of HDPE, color green.
 - c. Joints: Zero leak-rate heat-fusion joint conforming to ASTM D 3261.
 - d. Thrust Blocking: Appropriate thrust blocking, designed specifically for the pressures and soil conditions encountered, shall be installed at all fitting.
 - e. Manholes: See Note 722-P01 & 722-P02 for requirements.

B. Flushing Connections and Junction Manhole:

1. Manhole: Minimum 5' diameter meeting the requirements of Note 722-P01.
2. Ball Valves:
 - a. 2' Main Ball Valve: PVC, True Union ball valve, full port, threaded X PE butt fused end connections, 150 psi working pressure.
 - b. 1" Hose End Ball Valve: Bronze body with Type 316 stainless steel ball and stem, full port, vinyl coated stainless steel lever-style handle, threaded, minimum 150 psi working pressure.

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3. Universal Coupling: Brass, 110 psi working pressure, 1". Air King Universal Coupling as manufactured by Dixon Valve and Coupling Co. or approved equal.
4. Pressure Hose:
 - a. Tube: Nitrile synthetic rubber or Type P(EDPM) RMA Class A or B (High to medium oil resistance).
 - b. Temperature: -20° to 190° F.
 - c. Reinforcement: spiral or braided synthetic textile cord.
 - d. Cover: Synthetic rubber or Type P(EDPM) RMA Class A or B (high to medium oil resistance).
 - e. Pressure Class: Min 250 psi working pressure.
 - f. Connectors: Threaded brass with minimum 250 psi working pressure.
 - g. Size: Minimum 1" inside diameter.
 - h. Manufacturers: Gates 6B Dura Master® as manufactured by Gates Corporation, Wingfoot® as manufactured by Goodyear Engineered Products or approved equal.
5. Pipe Supports.
 - a. Adjustable Pipe Saddle Support w/ Strap: Two-piece, full circle pipe saddle with strap and neoprene liner to isolate and protect pipe; threaded pipe w/ adjuster; and threaded stand pipe, cross bolted to prevent up-lift. All metal items shall be stainless steel. TolCo Figures 311, 319 and 316T as manufactured by TolCo a brand of NIBCO, Inc. or approved equal.
 - b. Adjustable Pipe Saddle Support: One piece, saddle support with neoprene liner to isolate and protect pipe; threaded pipe w/adjuster, and threaded stand pipe, cross bolted to prevent up-lift. All metal items shall be stainless steel. TolCo Figures 317A and 316T as manufactured by TolCo a brand of NIBCO, Inc. or approved equal.
 - c. Pipe supports for smaller diameter pipe (2" and 3") may consist of Unistrut, or approved equal, channel, brackets and clamps. All metal parts shall be stainless steel. Neoprene liner is required on all pipe-to-support contact areas to isolate and protect pipe.
6. Miscellaneous Pipe and Fittings: Threaded, schedule 80 PVC.
- C. Private Lateral Wastewater Line Materials:
 1. Individual low pressure grinder pump station: Environment One D-Series as manufactured by Environment One Corporation.
 2. Low Pressure Sewer System pipe: HDPE pressure pipe meeting the requirements of Part A.
 3. Private Lateral Components:
 - a. Stainless steel combination curb stop valve/check valve assembly with valve box: Environment One Corporation "Uni-lateral" or approved equal with compatible polypropylene compression adapter fittings for connection to HDPE pipe.
 - b. Valve box shall be arch pattern.
 - c. Valve boxes shall include valve operator extension rod.
 - d. Valve boxes located in traffic areas shall be traffic rated iron or shall have a traffic rated frame and cover installed over the valve box.
 - e. Other components used in connecting the low pressure grinder pump station to the public low pressure system shall be compatible with the components of the pump station; especially in regards to galvanic corrosion of dissimilar metals.
- D. Pavement Repair: Any pavement disturbed by installation of water lines shall be replaced with a similar section or meet the minimums listed below:

Asphalt Pavement: 5.5IN Superpave FAA 45 PG 64-28 over 15 inches Base Course
 Concrete Pavement: 9IN Non-Reinf Concrete PVMT CL AE-Doweled over 8 inches Base Course

724-P13 REMOVE GATE VALVE AND BOX: This bid item includes all labor and materials necessary to fully remove existing gate valve and valve box including excavation, disposal and backfill. Adjacent pipes shall be capped and plugged with concrete.

724-P14 REMOVE HYDRANT: This bid item includes all labor and materials necessary to protect and remove an existing fire hydrant assembly, salvage and return said hydrant to City of Williston Public Works including excavation, backfill and transportation. Adjacent pipes shall be capped and plugged with concrete.

724-P15 ABANDON VALVE BOX: This bid item includes all labor and materials necessary to close the valve, excavate and remove a minimum of the 24-inches of valve box, fill the bottom of the box with a minimum of 8-inches of sand or aggregate base and fill the remaining valve box with concrete, and backfill the excavation.

724-P16 FITTINGS-DUCTILE IRON: This item includes both 12IN Cross and 12IN x 6IN Cross fittings.

724-P17 2IN CURB STOP & BOX: This item includes both water and low pressure sewer curb stop & box appurtenances. Sewer curb stop & box items also include a 2IN sewer check valve per detail on Section 20 Sheet 7.

744-P01 POLYSTYRENE INSULATION BOARD
 A. Materials-Insulation board consists of extruded polystyrene insulation meeting the requirements of AASHTO M-230.
 B. Installation-Install insulation whenever the sewer or water mains or services pass within 2 feet beneath a storm sewer or whenever minimum cover depth of 7-1/2 feet is not maintained. When crossing a storm sewer,

extend the insulation a minimum of 4 feet beyond the outer walls of the storm sewer. Refer to detail in Section 20 of the plans.

1. Insulation shall be on a firm compacted and smooth base. Sand may be used to provide the base. Cover insulation with 12 inches of sand or other suitable granular base prior to any compaction or additional backfill is placed.
2. Place the insulation boards 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.

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 existing sanitary sewer pipe, sealing the removed sewer pipe opening with mortar, and coring and mortaring the new sanitary sewer pipe into the existing manhole being modified as shown in the plan sheets.

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ESTIMATE OF QUANTITIES

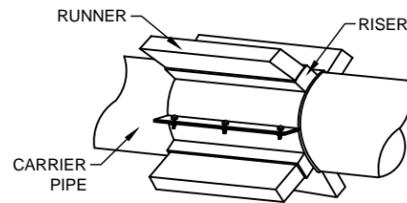
	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
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SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
103	0100	CONTRACT BOND	L SUM	0.07
103	0200	ESCROW OF BID DOCUMENTATION	L SUM	0.07
202	0174	REMOVAL OF PIPE ALL TYPES AND SIZES	LF	63
702	0100	MOBILIZATION	L SUM	0.07
722	0100	MANHOLE 48IN	EA	5
722	0110	MANHOLE 60IN	EA	1
722	2500	MANHOLE SPECIAL	EA	3
722	3291	ABANDON SANITARY SEWER MANHOLE	EA	1
724	0210	FITTINGS-DUCTILE IRON	LBS	598
724	0270	REMOVE GATE VALVE & BOX	EA	6
724	0280	GATE VALVE & BOX 3IN	EA	1
724	0300	GATE VALVE & BOX 6IN	EA	31
724	0310	GATE VALVE & BOX 8IN	EA	4
724	0314	GATE VALVE & BOX 12IN	EA	13
724	0411	6IN HYDRANT	EA	16
724	0430	REMOVE HYDRANT	EA	2
724	0621	WATER SERVICE LINE 2IN	LF	14
724	0626	WATER SERVICE LINE 3IN	LF	26
724	0636	WATER SERVICE LINE 6IN	LF	595
724	0810	WATERMAIN 6IN PVC	LF	279
724	0820	WATERMAIN 8IN	LF	387
724	0850	WATERMAIN 12IN PVC	LF	2690
724	0851	BORE & PUSH 12IN PVC WATER	LF	317
724	1095	BORE SANITARY SEWER PIPE	LF	212
724	1110	8IN SANITARY SEWER PIPE	LF	556
724	1118	15IN SANITARY SEWER PIPE	LF	479
724	1120	6IN SEWER SERVICE PIPE	LF	329
724	1180	1 1/4IN SEWER CURB STOP AND CHECK VALVE	EA	1
724	6013	ABANDON VALVE BOX	EA	3
724	6030	ABANDON WATER MAIN / SERVICE LINE	EA	6
724	6840	12IN 11.25DEG BEND	EA	1
724	6846	12IN TEE	EA	1
724	6980	8IN X 8IN X 6IN TEE	EA	2
724	6986	12IN X 12IN X 6IN TEE	EA	11
724	6987	12IN X 12IN X 8IN TEE	EA	1
724	6995	12IN X 8IN X 8IN TEE	EA	1
724	7004	6IN TEE	EA	8
724	7008	6IN 90DEG BEND	EA	1
724	7010	8IN X 6IN REDUCER	EA	4
724	7011	8 IN TEE	EA	1
724	7031	2IN CURB STOP & BOX	EA	1
724	8095	12IN X 8IN CROSS	EA	1
724	9014	FORCEMAIN 1 1/4IN	LF	9
724	9016	FORCEMAIN 2IN	LF	1531
724	9300	UTILITY TRENCH DAM	EA	59
744	0100	POLYSTYRENE INSULATION BOARD	BD FT	480
910	0570	MODIFY MANHOLE	EA	3

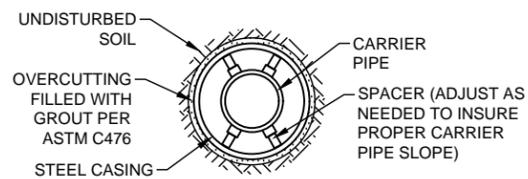
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GENERAL NOTES:

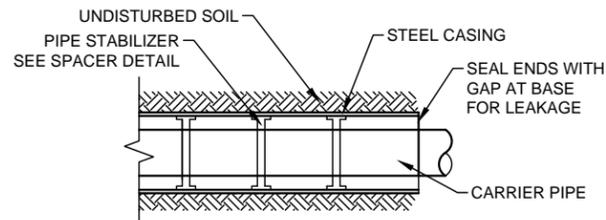
- CASING SHALL BE CONSTRUCTED TO PREVENT LEAKAGE OF GROUNDWATER AND SOIL INTO THE CASING THROUGHOUT ITS LENGTH.
- END OF CASING PIPE SHALL BE SEALED TO PREVENT COLLECTION OF WATER AND SOIL IN CASING. A GAP SHALL BE LEFT FOR DRAINAGE IN CASE OF LEAKAGE.
- CASING PIPE SHALL BE WELDED SMOOTH STEEL MEETING ASTM A36 SPECIFICATIONS WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI.
- A CASING PIPE SIZE OF 16" SHALL HAVE A MINIMUM THICKNESS OF 0.250 INCHES. A CASING PIPE SIZE OF 20" SHALL HAVE A MINIMUM THICKNESS OF 0.312 INCHES.
- SPACERS SHALL BE INSTALLED PER MANUFACTURERS RECOMMENDATIONS. SPACERS SHALL BE OF APPROPRIATE SIZE TO SECURE THE CARRIER PIPE IN THE CASING PIPE. USE A MINIMUM OF 2 SPACERS PER JOINT OF PIPE OR 20' OF PIPE. SPACERS MAY BE OMITTED FOR FUSED PIPE IF LINE AND GRADE CAN BE ACHIEVED.
- THE VOID SPACE BETWEEN THE CASING AND THE BORE SHALL BE FILLED WITH CEMENT GROUT PUMPED UNDER PRESSURE. THE GROUT SHALL CONFORM TO ASTM C476 AND SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 200-PSI. PRESSURE GROUTING SHALL TAKE PLACE WITHIN 24 HOURS OF FINAL PLACEMENT OF THE CASING PIPE.



CASING SPACER

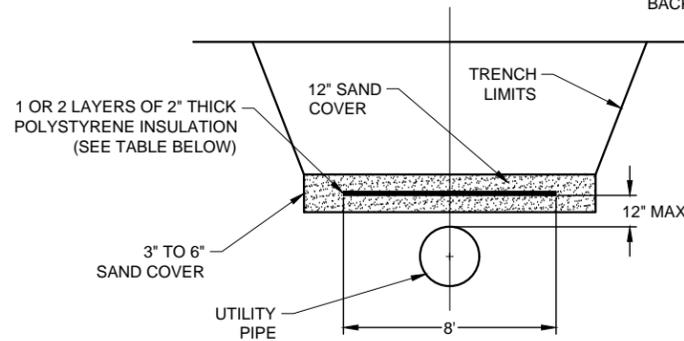
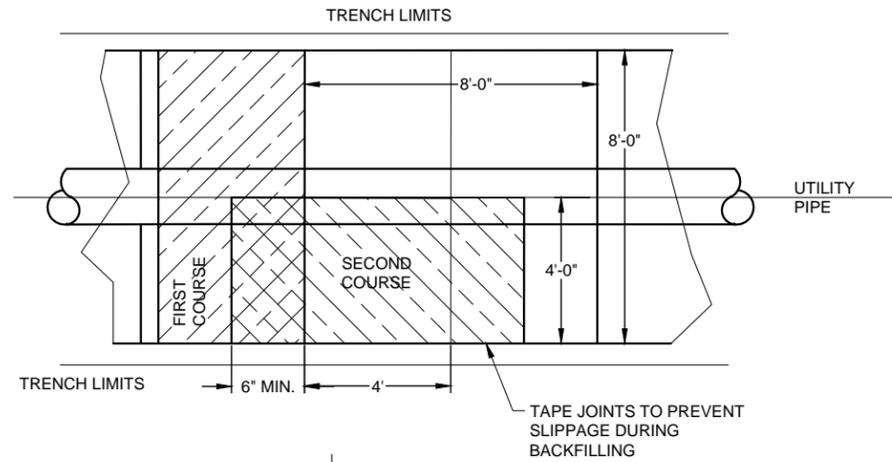


PIPE AND CASING SECTION



PIPE AND CASING PROFILE

BORE DETAILS
N.T.S.



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

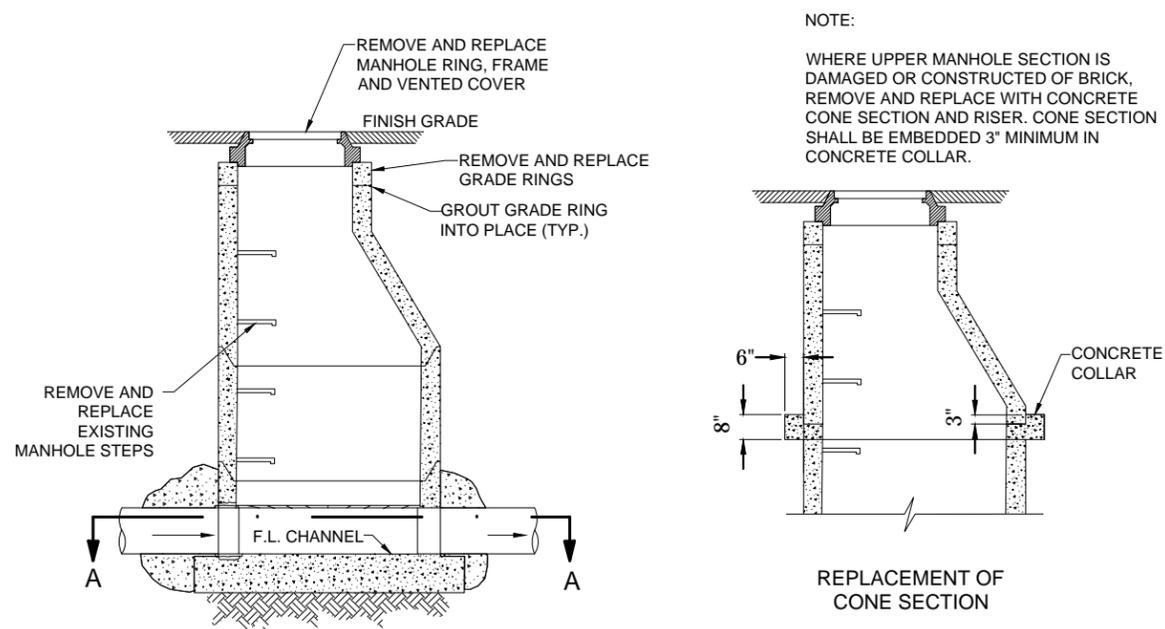
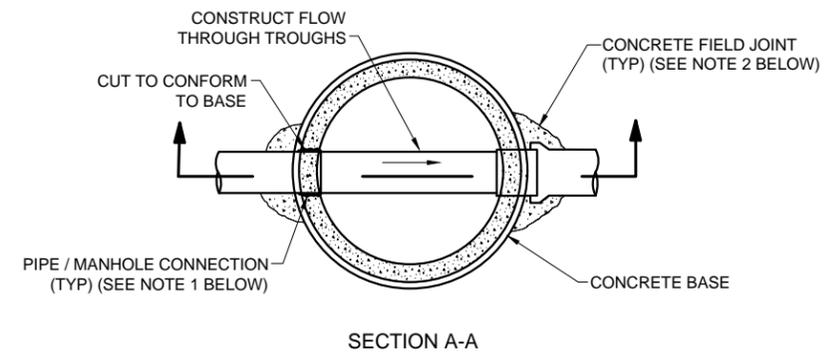
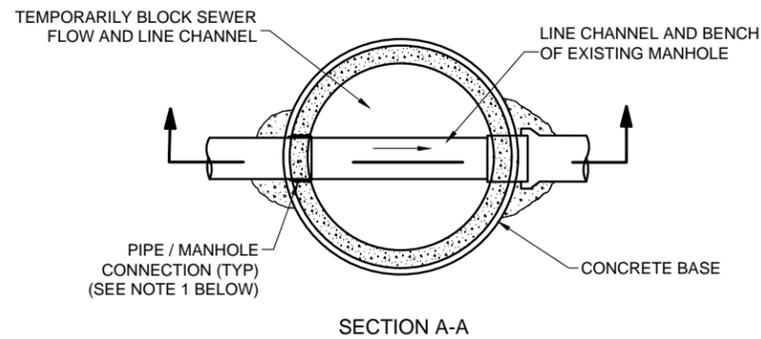
UTILITY INSULATION REQUIREMENTS
N.T.S.

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DETAILS

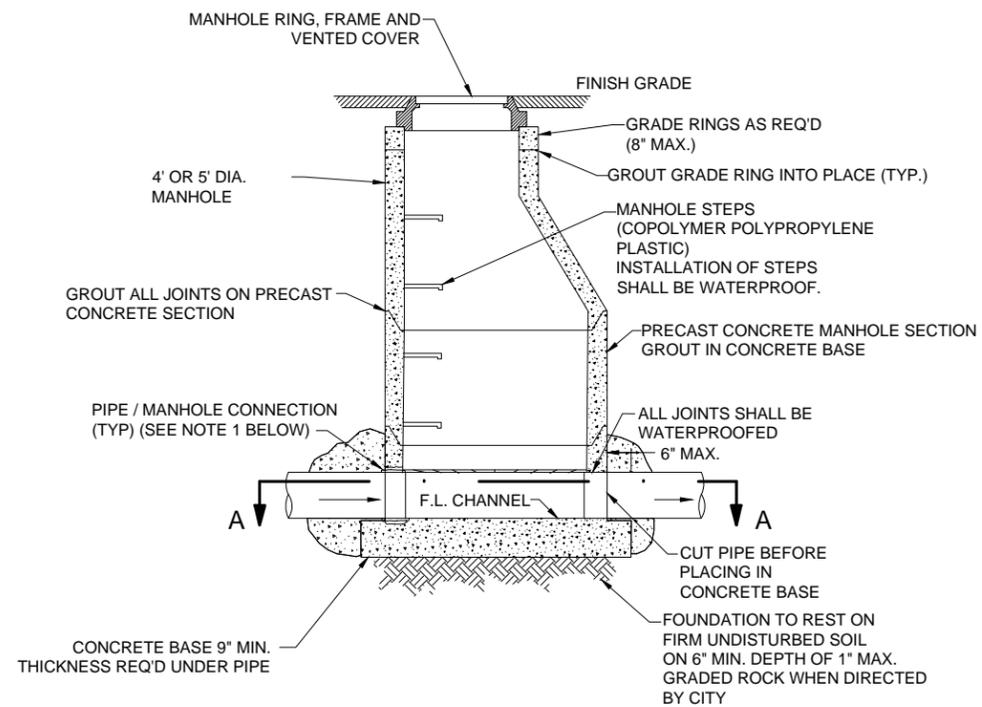
NEW UTILITIES
WILLISTON, NORTH DAKOTA

	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
	ND	CPU-7-993(050)057	21707	20	2



- 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. MANHOLE STEPS INSTALLED INTO FRACTURED SUBSTRATE SHALL BE EPOXY REINFORCED

RECONSTRUCT MANHOLE
N.T.S.



- 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

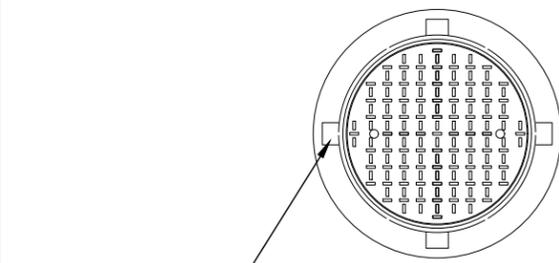
SANITARY SEWER MANHOLE
N.T.S.

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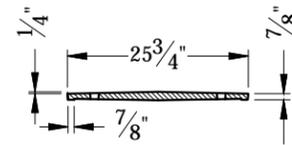
DETAILS

NEW UTILITIES
WILLISTON, NORTH DAKOTA

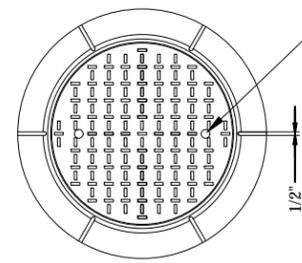
	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
	ND	CPU-7-993(050)057	21707	20	3



INTEGRAL CAST ANCHORS AT 90°

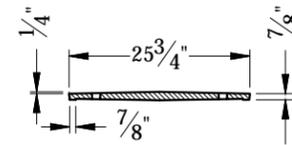


TOP

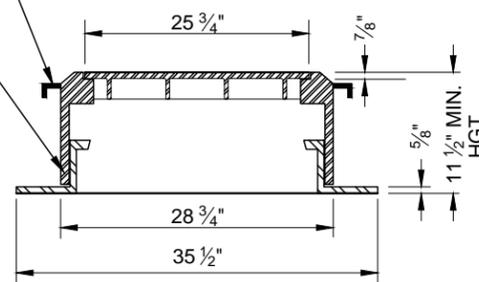


2 - 1 1/4" DIA. LIFT HOLES ARE TO EXTEND ALL THE WAY THROUGH MANHOLE COVER

LID

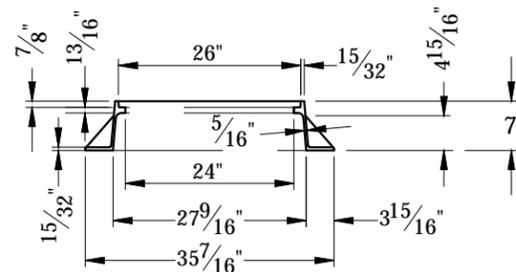


5" x 3/16" NEOPRENE GASKET, SECURED WITH STAINLESS STEEL WORM DRIVE CLAMPS

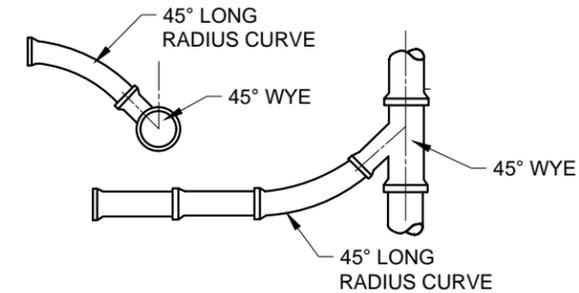


FRAME

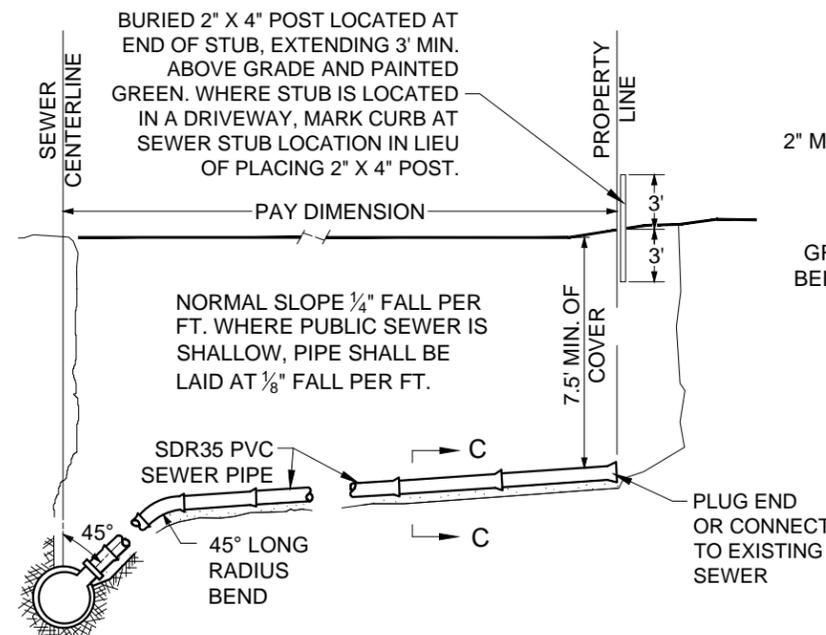
CAST IRON RING & COVER (CONCRETE PAVEMENT)



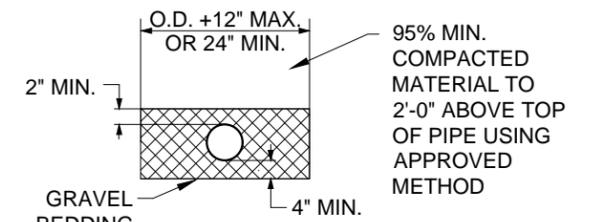
CAST IRON RING & COVER (NON-CONCRETE PAVEMENT)



LATERAL CONNECTIONS SANITARY SEWER



CURB CONNECTIONS SANITARY SEWER

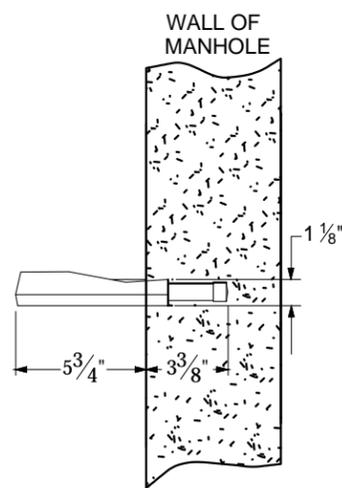


SECTION C - C

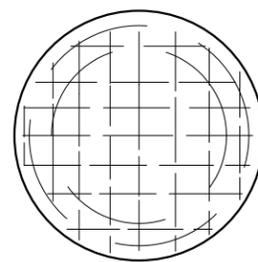
SEWER SERVICE DETAILS
N.T.S.

NOTE:

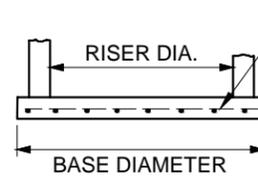
MANHOLE STEPS SHALL BE COPOLYMER POLYPROPYLENE PLASTIC. STEPS TO BE FIRMLY EMBEDDED AND SHALL MEET ASTM C-497 TESTS FOR WITHSTANDING PULLING OUT. STEPS TO BE ALIGNED VERTICALLY AND SPACED 12 INCHES ON CENTER WITH THE TOP STEP NO GREATER THAN 24" FROM TOP OF CASTING.



STEP DETAIL



TOP VIEW



PRECAST BASE

REINFORCED STEEL AT MID-DEPTH OF BASE

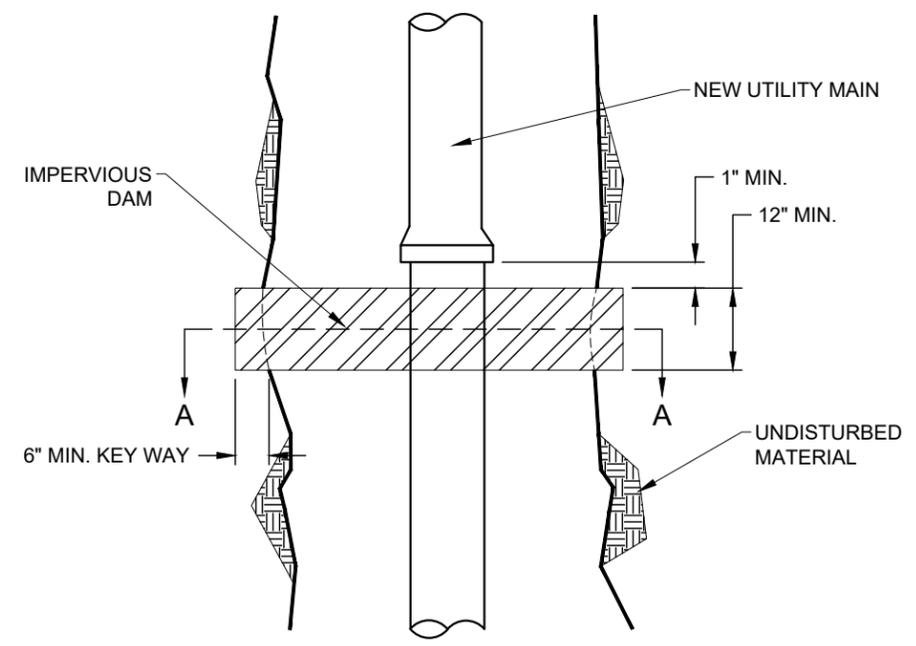
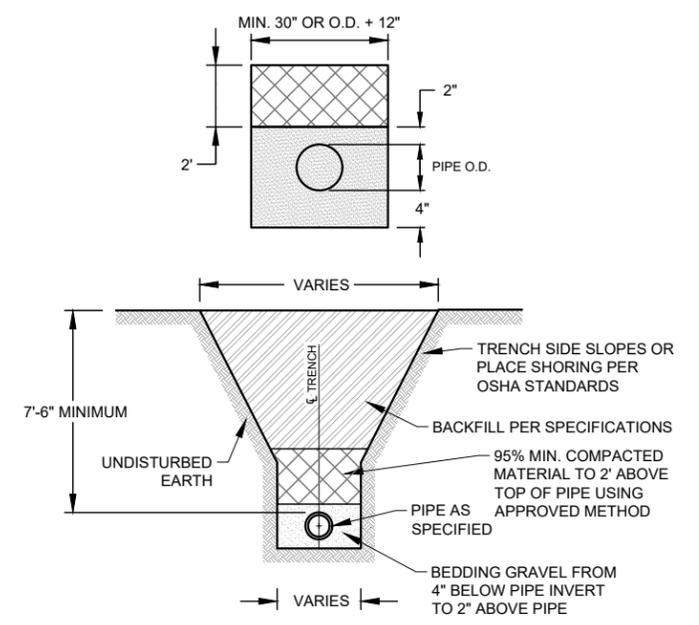
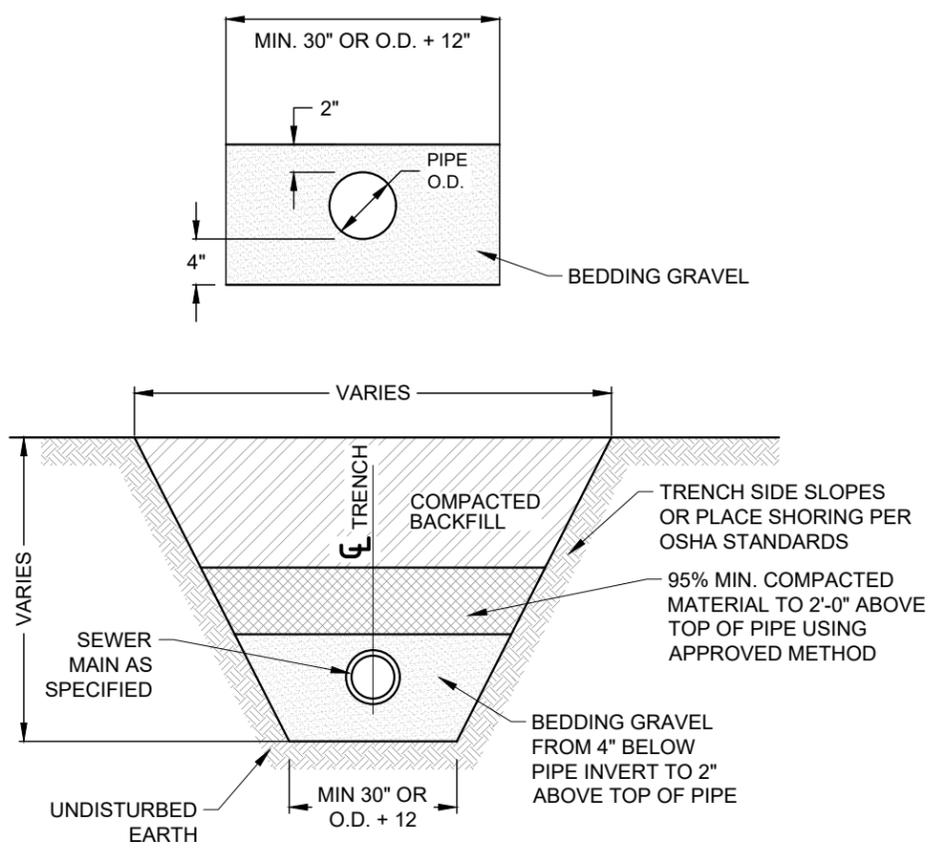
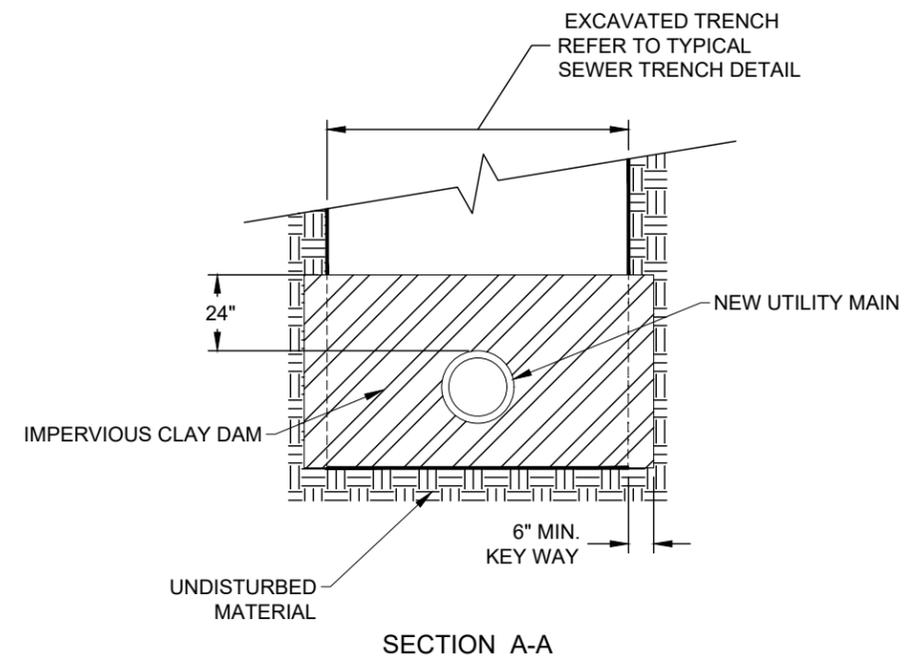
MANHOLE DETAILS
N.T.S.

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DETAILS

NEW UTILITIES
WILLISTON, NORTH DAKOTA

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TYPICAL SANITARY TRENCH
N.T.S.

TYPICAL WATER LINE BACKFILL
N.T.S.

PIPE TRENCH DAM
N.T.S.

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DETAILS

NEW UTILITIES
WILLISTON, NORTH DAKOTA

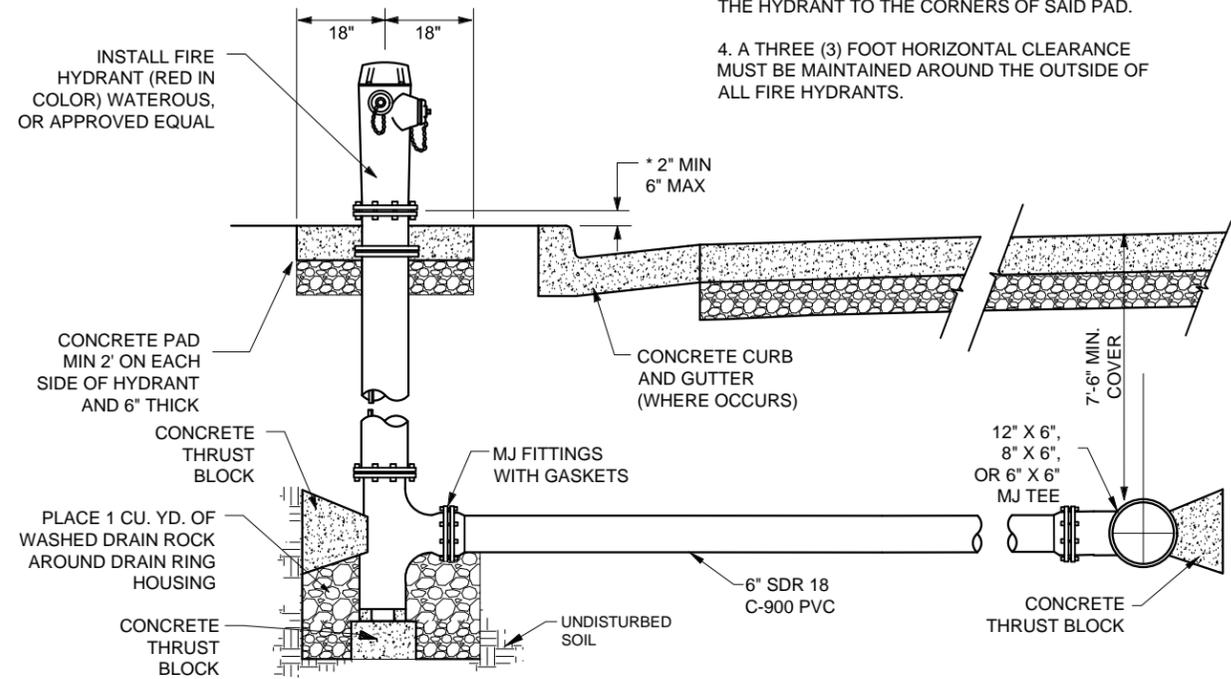
STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	CPU-7-993(050)057	21707	20	5

NOTES:

1. ALL BURIED FITTINGS AND BOLTS TO BE MECHANICAL JOINT AND STAINLESS STEEL AND TO BE FREE FROM CONCRETE AND FULLY ACCESSIBLE.

3. WHEN INSTALLING CONCRETE PAD AROUND FIRE HYDRANT CONTRACTOR SHALL PLACE CRACK CONTROL JOINTS DIAGONALLY FROM THE HYDRANT TO THE CORNERS OF SAID PAD.

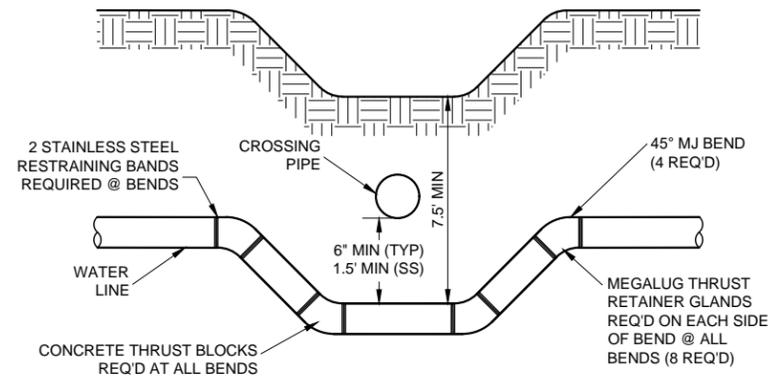
4. A THREE (3) FOOT HORIZONTAL CLEARANCE MUST BE MAINTAINED AROUND THE OUTSIDE OF ALL FIRE HYDRANTS.



6" FIRE HYDRANT ASSEMBLY
N.T.S.

NOTE:

WHERE POSSIBLE, WATER LINES ARE TO BE GRADUALLY RAISED OR LOWERED TO AVOID CONFLICTS AND TO AVOID REQUIRING LOOPING. LOOPING OF WATER LINE TO BE USED ONLY WHEN NO OTHER ALTERNATIVE EXISTS.



TYPICAL WATER LINE LOOP
N.T.S.

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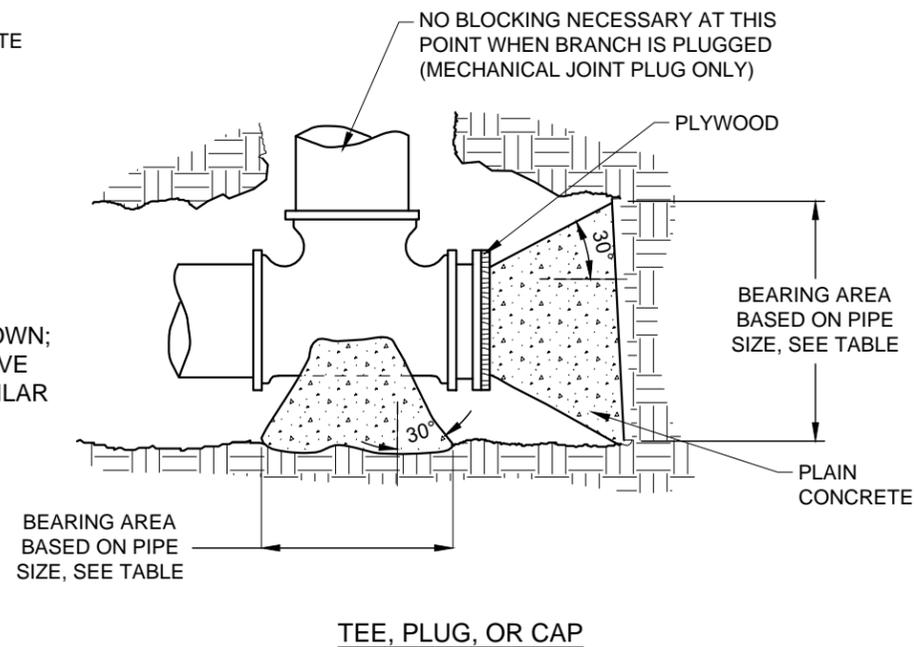
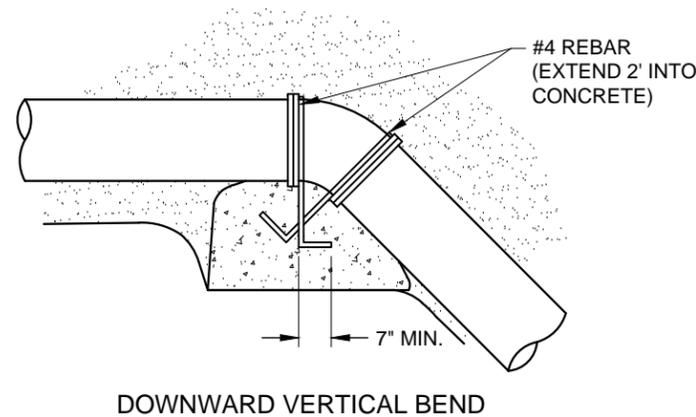
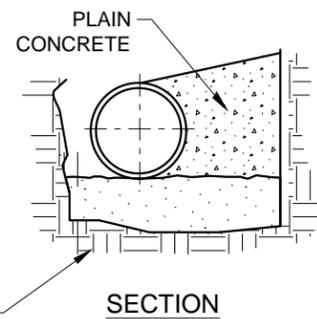
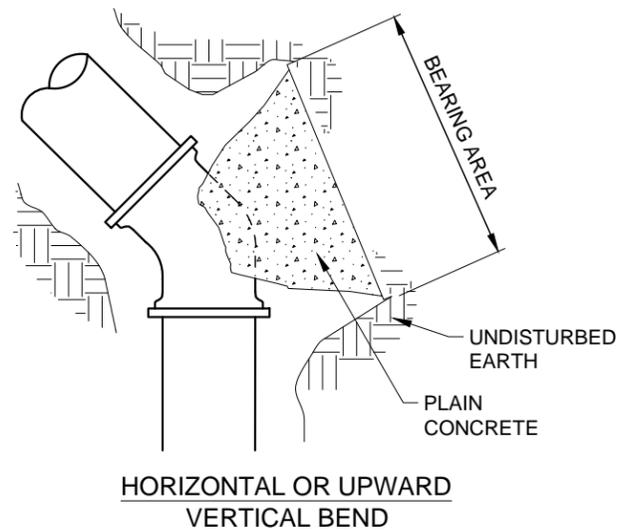
NEW UTILITIES
WILLISTON, NORTH DAKOTA

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
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TABLE OF REQUIRED BEARING AREAS (SQUARE FEET)					
Size of Pipe	90° Bend	45° Bend	22.5° Bend	11.25° Bend	Tees, Plugs & Tapping Sleeves
4"	2 SF	2 SF	2 SF	2 SF	2 SF
6"	3 SF	2 SF	2 SF	2 SF	3 SF
8"	5 SF	3 SF	2 SF	2 SF	4 SF
10"	8 SF	4 SF	3 SF	2 SF	6 SF
12"	11 SF	6 SF	3 SF	2 SF	8 SF
16"	20 SF	11 SF	6 SF	4 SF	15 SF
18"	25 SF	14 SF	7 SF	4 SF	18 SF

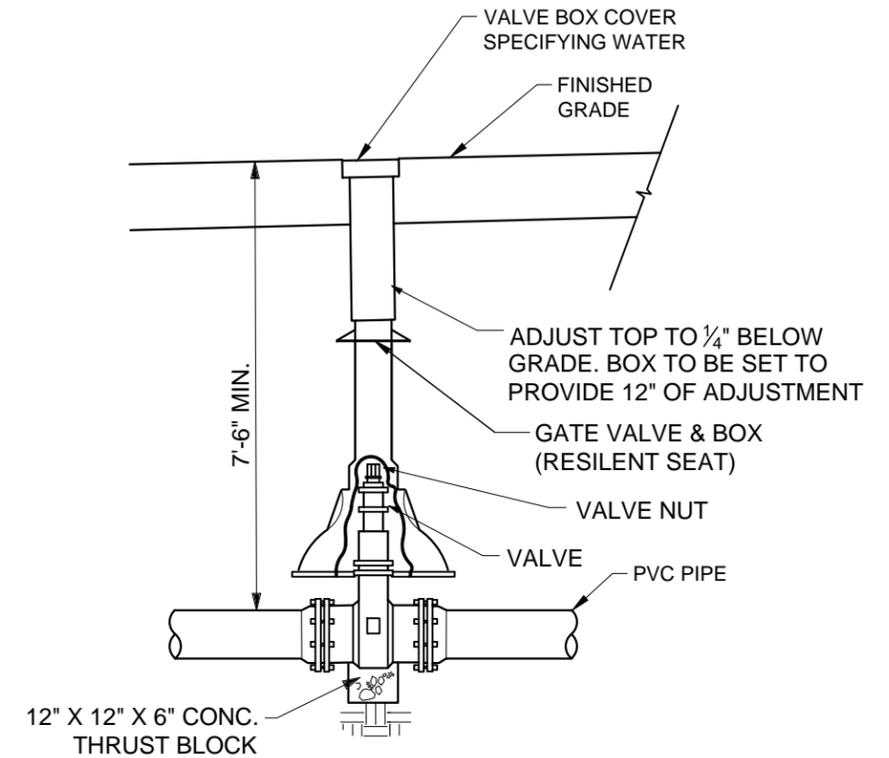
NOTES

1. CONCRETE BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH. KEEP BELLS AND BOLTS FREE OF CONCRETE.
2. EXPOSED (NOT ENCASED IN CONCRETE) REBAR SHALL BE WRAPPED IN 10 MIL DIELECTRIC TAPE.
3. ALL CONCRETE SHALL BE 3000 PSI MINIMUM, 28 DAY COMPRESSIVE STRENGTH.
4. THE TABLE DENOTES MINIMUM BEARING AREA OR VOLUME OF THE THRUST BLOCK.
5. ALL VERTICAL SURFACES NOT BEARING AGAINST UNDISTURBED EARTH SHALL BE FORMED WITH PLYWOOD.
6. MEGALUG RESTRAINTS REQUIRED AT ALL FITTINGS.



NOTES:

TEE & PLUG BLOCKING SHOWN; TAPPING SLEEVE BLOCKING SIMILAR



GATE VALVE
N.T.S.

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DETAILS

NEW UTILITIES
WILLISTON, NORTH DAKOTA

THRUST BLOCKS DETAIL
N.T.S.

FROST PROOF AND WATER-TIGHT SEAL-DOWN MANHOLE FRAME AND COVER

FINISHED GRADE

ECCENTRIC CONE

TRACER WIRE

1" BALL VALVE (BRASS)

1" UNIVERSAL COUPLING FLUSHING CONNECTION (BRASS)

5'-0" MINIMUM DIAMETER

1" X 12' MIN. LONG PRESSURE HOSE W/ THREADED BRASS END CONNECTIONS

FLEXIBLE CONNECTOR

2" BALL VALVE (PVC W/ UNION CONNECTIONS)

PE: BUTT FUSED PVC: THREADED

7" MIN.

HDPE REDUCER AS REQUIRED
HDPE LOW PRESSURE SEWER MAIN (1 1/2" TO 4")

2"x1" THREADED BUSHING

CAP END AND POSITION SECURELY AGAINST MANHOLE WALL

2" PVC

2"x2"x2" TEE

STAINLESS STEEL PIPE SUPPORT WITH NEOPRENE LINER

NOTES:

1. ALL HDPE JOINTS SHALL BE BUTT FUSED. ALL PVC PIPE AND FITTINGS SHALL BE SCH. 80 PVC WITH THREADED JOINTS
2. SECURE STAINLESS STEEL SUPPORT BASE PLATE TO FLOOR WITH 1/4" STAINLESS STEEL EPOXY ANCHORS.

DEAD END LOW PRESSURE FLUSHING CONNECTION
N.T.S.

FINISHED GRADE

EASEMENT, PROPERTY OR R.O.W. LINE

2x4 WOOD POST MARKER EXTEND 2' MINIMUM ABOVE FINISHED GRADE

±5'

EXTENSION TYPE CURB BOX WITH ARCH PATTERN BASE. PROVIDE TRAFFIC RATED BOX IN TRAFFIC AREAS.

7.5' MINIMUM COVER REQUIRED

INSTALL UTILITY WARNING TAPE 2'-3" ABOVE PIPE

PROVIDE VALVE OPERATOR EXTENSION

ELECTROFUSION SEWER SADDLE (OR BUTT-FUSED TEE)

1-1/4" OR 2" SDR 11 HDPE PIPE

HDPE LOW PRESSURE SEWER MAIN

COMPRESSION ADAPTER FITTING

CURB STOP VALVE WITH INTEGRAL CHECK VALVE (STAINLESS STEEL)

COMPRESSION ADAPTER FITTING

1-1/4" OR 2" SDR 11 HDPE PIPE

EXTEND PIPE 1' TO 2'

CONCRETE THRUST BLOCK MINIMUM 1 FOOT SQUARE, 6" THICK

FUSION WELDED CAP

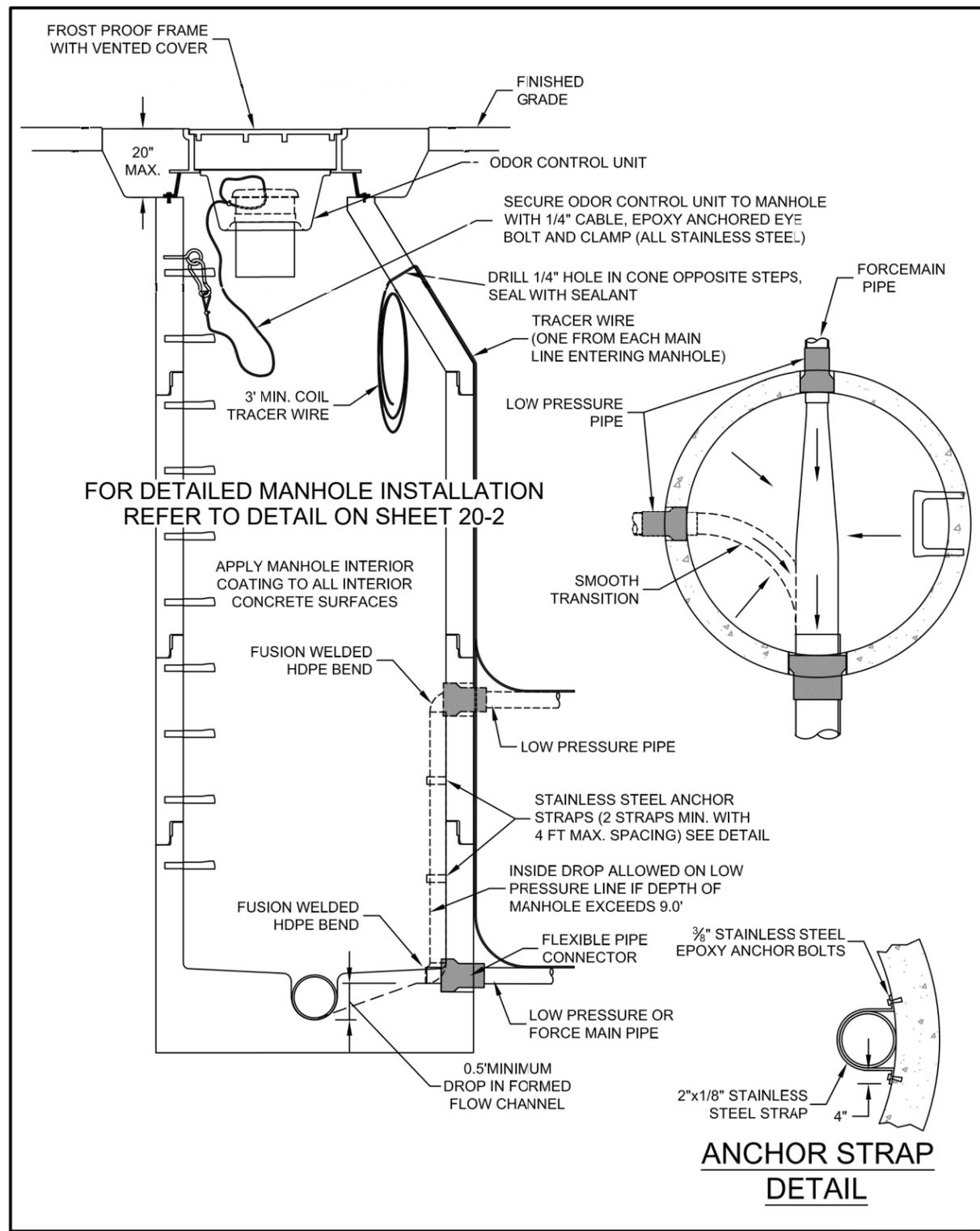
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LOW PRESSURE PRIVATE LATERAL
N.T.S.

DETAILS

NEW UTILITIES
WILLISTON, NORTH DAKOTA

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FOR DETAILED MANHOLE INSTALLATION REFER TO DETAIL ON SHEET 20-2

**ANCHOR STRAP
DETAIL**

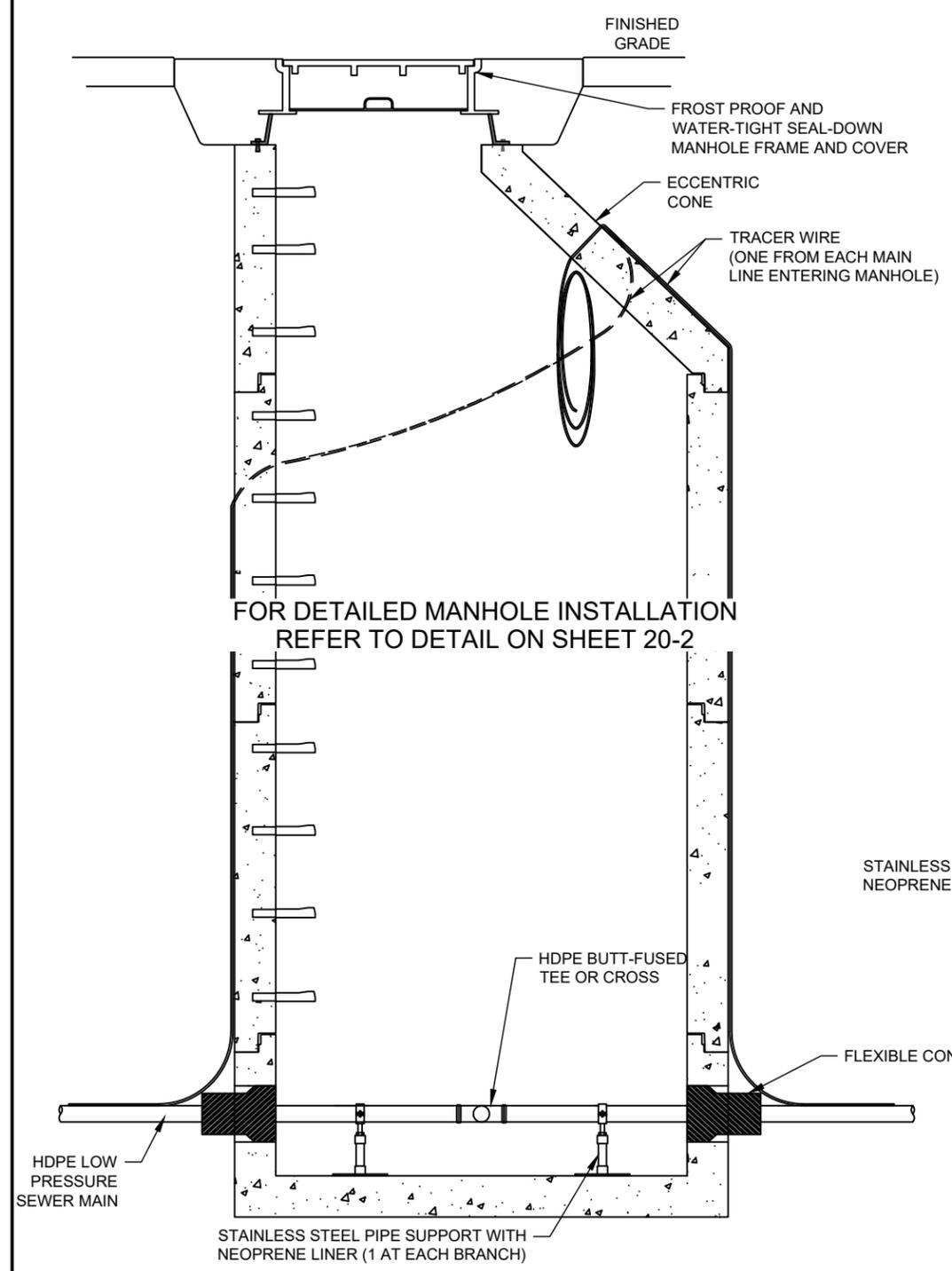
PRESSURE LINE CONNECTION TO MANHOLE
N.T.S.

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DETAILS

NEW UTILITIES
WILLISTON, NORTH DAKOTA

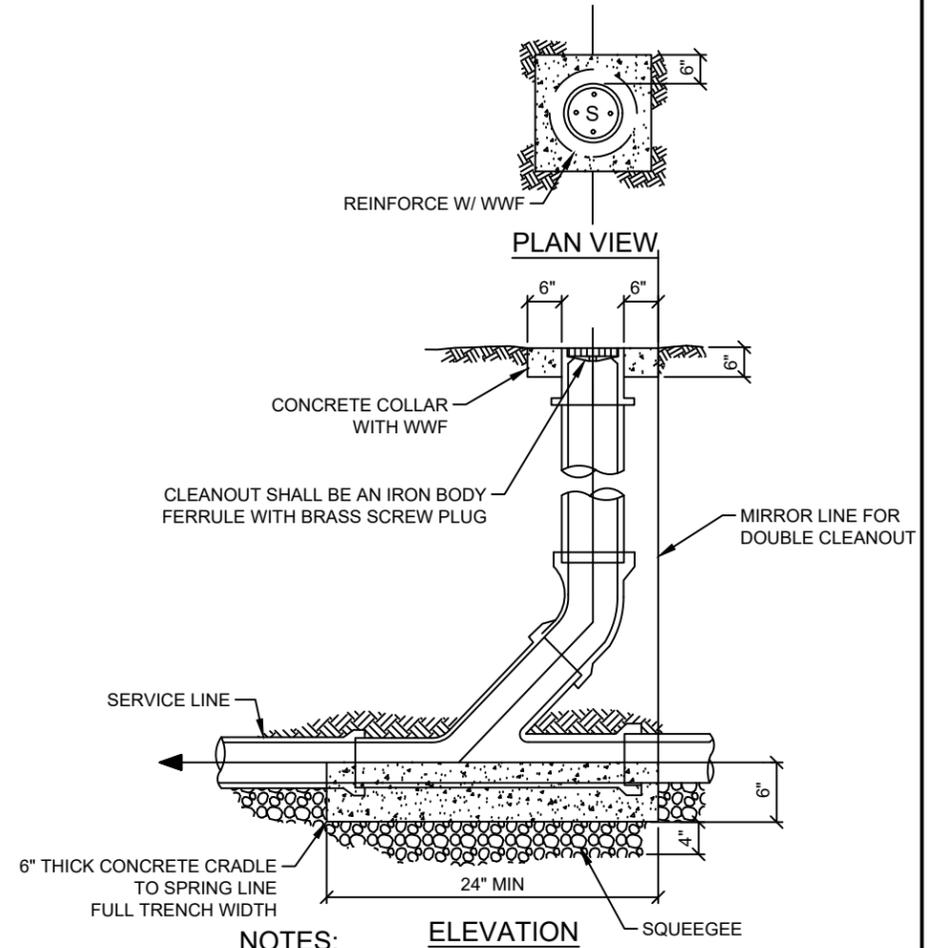
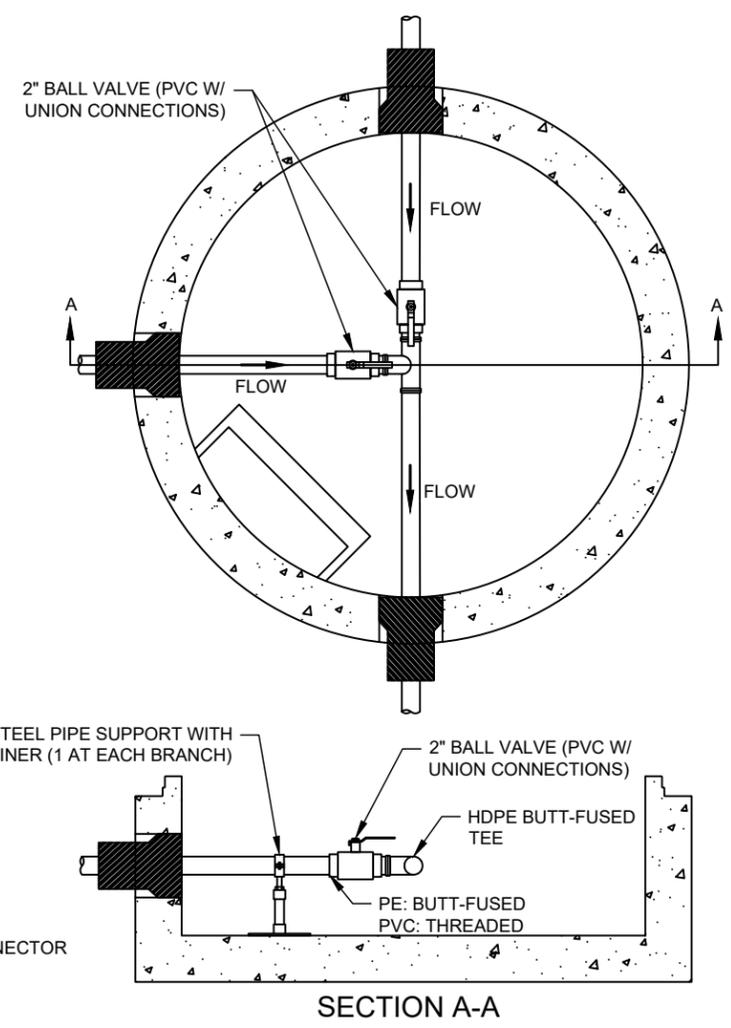
STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	CPU-7-993(050)057	21707	20	9



FOR DETAILED MANHOLE INSTALLATION REFER TO DETAIL ON SHEET 20-2

- NOTES:
1. ALL PIPE AND FITTINGS SHALL BE BUTT-FUSED HDPE.
 2. SECURE STAINLESS STEEL SUPPORT BASE PLATES TO FLOOR WITH 1/4" STAINLESS STEEL EPOXY ANCHORS.

LOW PRESSURE JUNCTION MANHOLE
N.T.S.

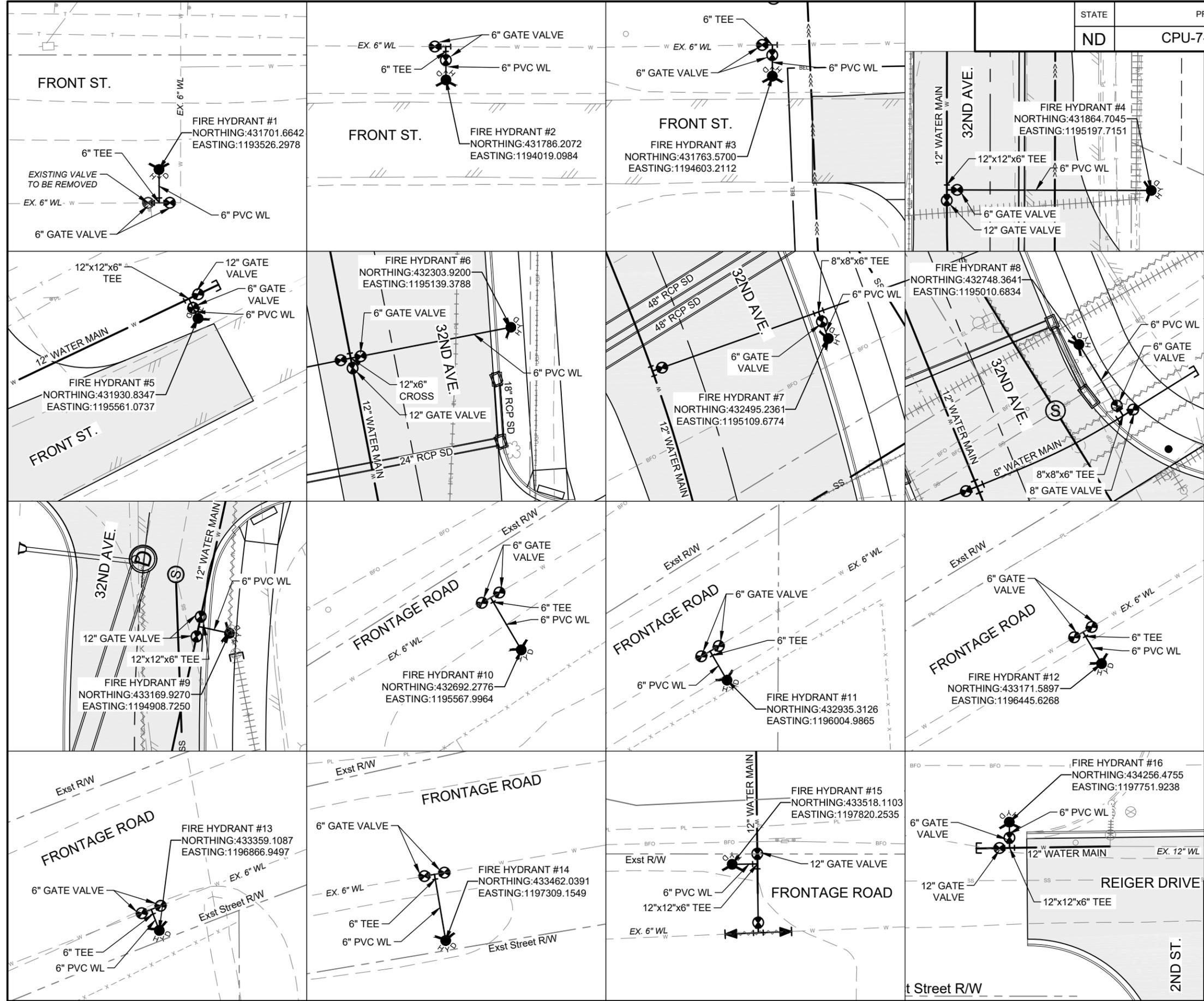


- NOTES:
1. WHERE CLEANOUT IS INSTALLED IN SODDED AREAS DEPRESS CONCRETE COLLAR 2" BELOW FINISHED GRADE
 2. CLEANOUT RISERS TO BE SAME DIAMETER AS SERVICE LINE (TYP)

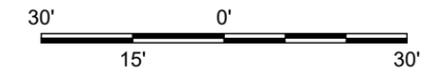
SEWER CLEANOUT DETAIL
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DETAILS
 NEW UTILITIES
 WILLISTON, NORTH DAKOTA



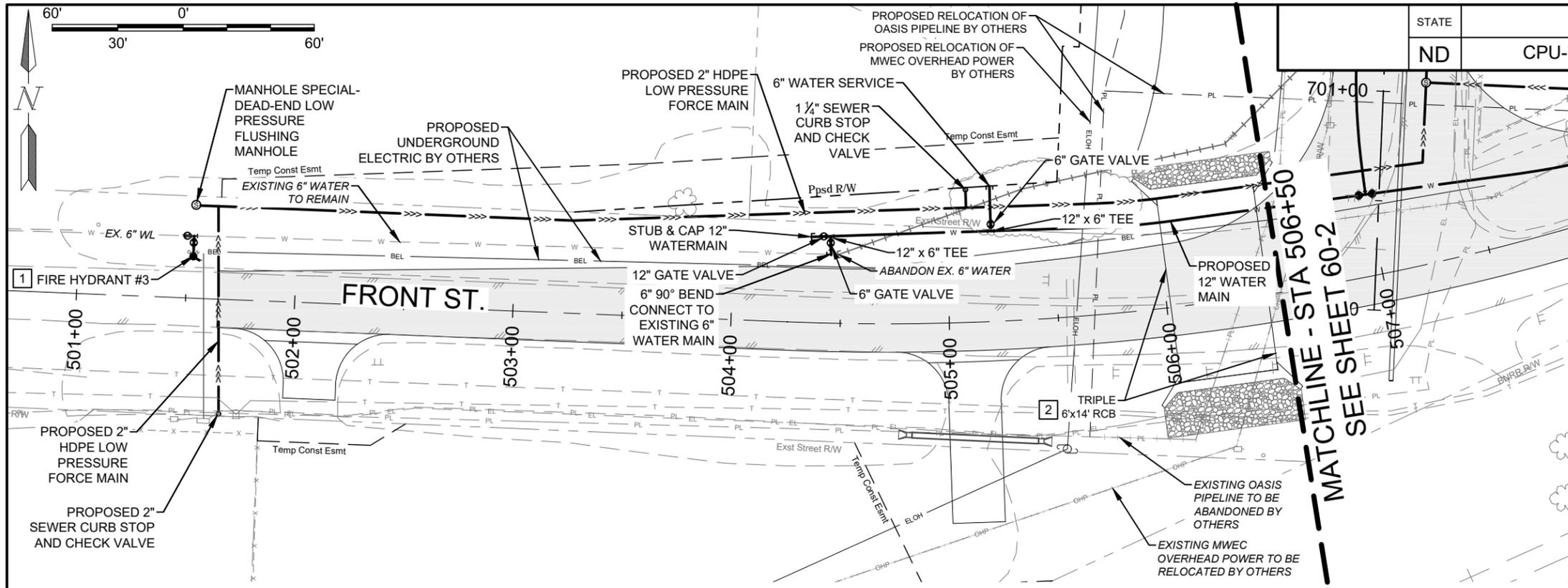
SPEC CODE	BID ITEM	QTY	UNIT
724 0210	FITTINGS-DUCTILE IRON (12IN X 6IN CROSS)	159	LBS
		Tot	159 LBS
724 0270	REMOVE GATE VALVE & BOX	1	EA
		Tot	1 EA
724 0300	GATE VALVE & BOX 6IN	22	EA
		Tot	22 EA
724 0310	GATE VALVE & BOX 8IN	1	EA
		Tot	1 EA
724 0314	GATE VALVE & BOX 12IN		
		7	EA
		Tot	7 EA
724 0411	6IN HYDRANT	16	EA
		Tot	16 EA
724 0810	WATERMAIN 6IN PVC	271	LF
		Tot	271 LF
724 6980	8IN X 8IN X 6IN TEE	2	EA
		Tot	2 EA
724 6986	12IN X 12IN X 6IN TEE	5	EA
		Tot	5 EA
724 7004	6IN TEE	8	EA
		Tot	8 EA



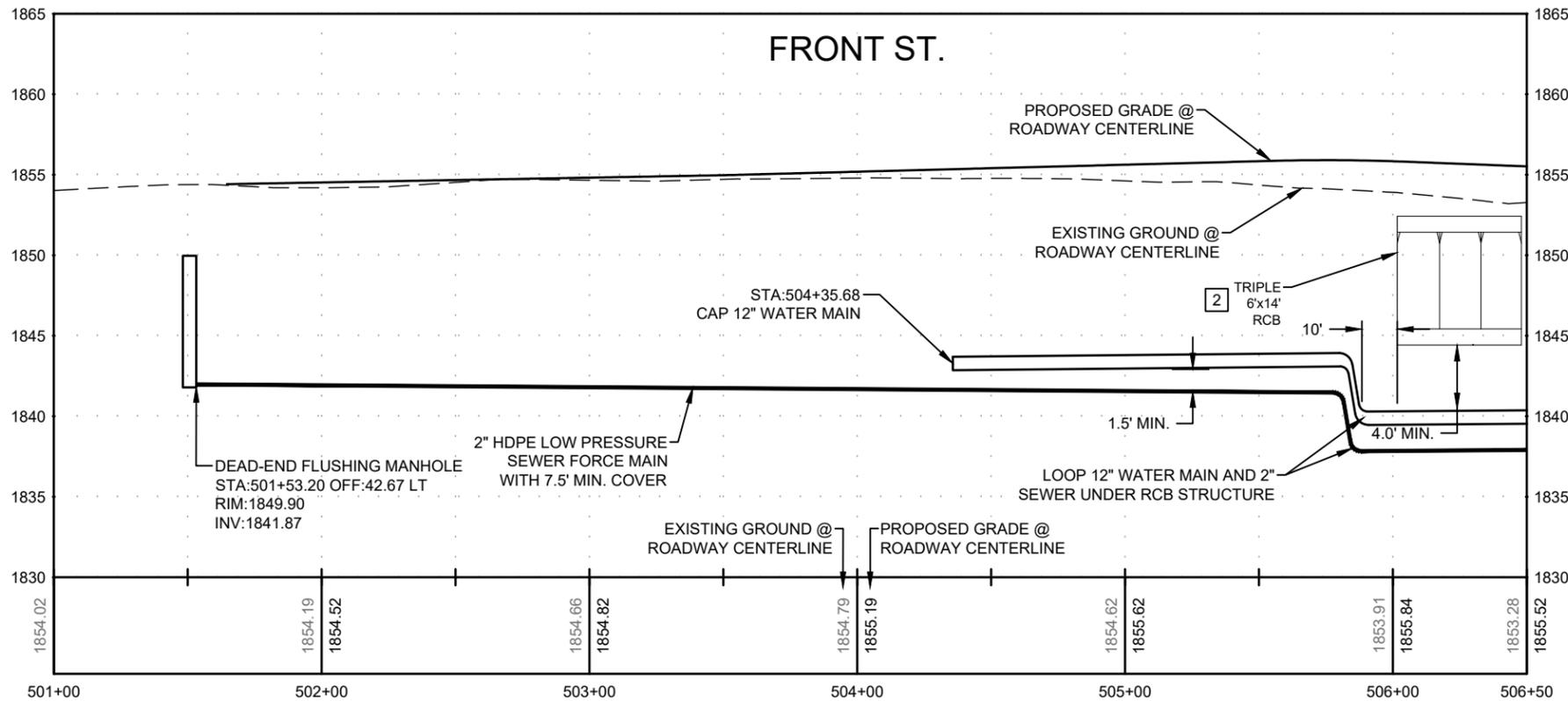
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HYDRANT DATA

NEW UTILITIES
WILLISTON, NORTH DAKOTA



SPEC CODE	BID ITEM	QTY	UNIT
722 2500	MANHOLE SPECIAL Sta 501+53 - 43' Lt (DEAD END FLUSH)	1	EA
		Tot	1 EA
724 0300	GATE VALVE & BOX 6IN Sta 505+21 - 44' Lt Sta 504+45 - 37' Lt	1	EA
		Tot	2 EA
724 0314	GATE VALVE & BOX 12IN Sta 504+42 - 40' Lt	1	EA
		Tot	1 EA
724 0636	WATER SERVICE LINE 6IN Sta 505+ 20 - 42' Lt to Sta 505+ 20 - 63' Lt	21	LF
		Tot	21 LF
724 0810	WATERMAIN 6IN PVC Sta 504+45 - 40' Lt to Sta 504+45 - 31' Lt	8	LF
		Tot	8 LF
724 0850	WATERMAIN 12IN PVC Sta 504+36 - 39' Lt to Sta 506+50 - 39' Lt	208	LF
		Tot	208 LF
724 1180	1 1/4IN SEWER CURB STOP & CHECK VALVE Sta 505+09 - 61' Lt	1	EA
		Tot	1 EA
724 6030	ABANDON WATER MAIN / SERVICE LINE Sta 504+48 - 31' Lt	1	EA
		Tot	1 EA
724 6986	12IN X 12IN X 6IN TEE Sta 504+45 - 40' Lt Sta 505+21 - 29' Lt	1	EA
		Tot	2 EA
724 7008	6IN 90DEG BEND Sta 504+45 - 31' Lt	1	EA
		Tot	1 EA
724 7031	2IN CURB STOP & BOX Sta 501+67 - 52' Rt (SEWER)	1	EA
		Tot	1 EA
724 9014	FORCEMAIN 1 1/4IN Sta 505+09 - 52' Lt to Sta 505+09 - 61' Lt	9	LF
		Tot	9 LF
724 9016	FORCEMAIN 2IN Sta 501+ 53 - 43' Lt to Sta 506 + 50 - 50' Lt Sta 501+ 63 - 43' Lt to Sta 501 + 67 - 52' Rt	485	LF
		95	LF
		Tot	580 LF



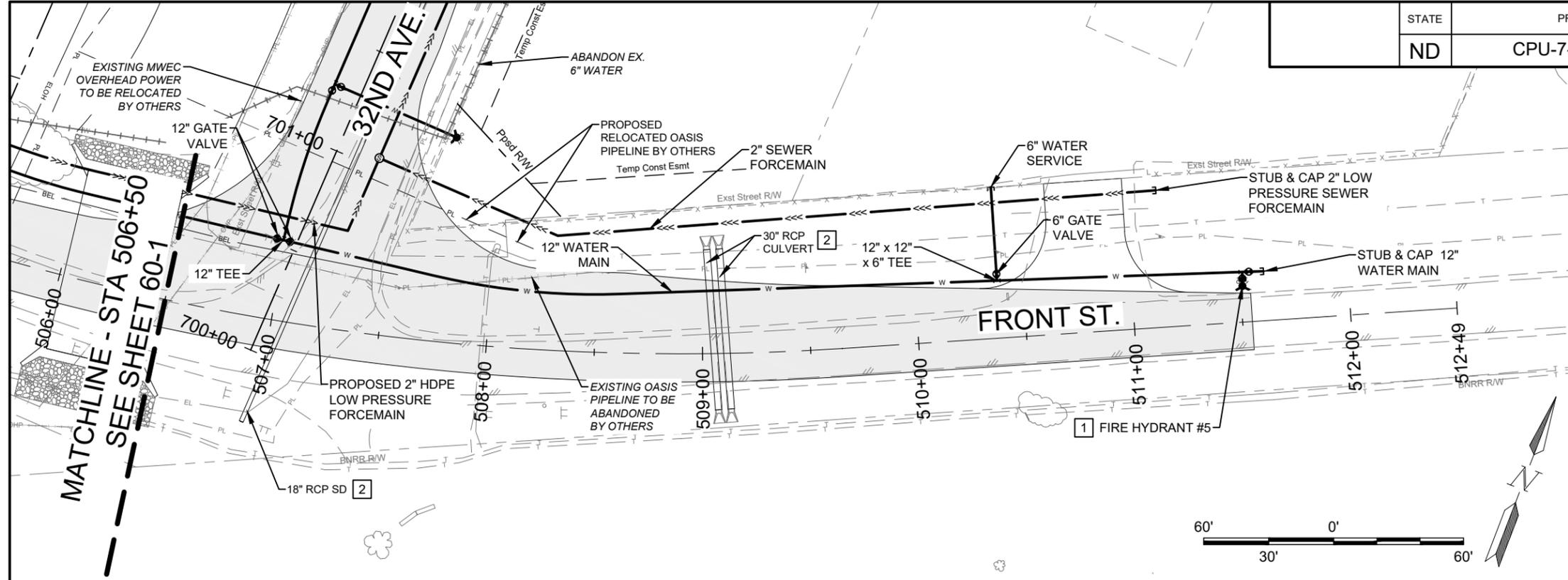
- 1 SEE HYDRANT DATA SHEET FOR FIRE HYDRANT LOCATION AND QUANTITIES, INCLUDING ASSOCIATED VALVES AND TEES
- 2 STORM DRAIN IMPROVEMENTS ARE SHOWN FOR INFORMATION ONLY, REFER TO TIED PROJECT SOIB-SOIA-7-002(157)017

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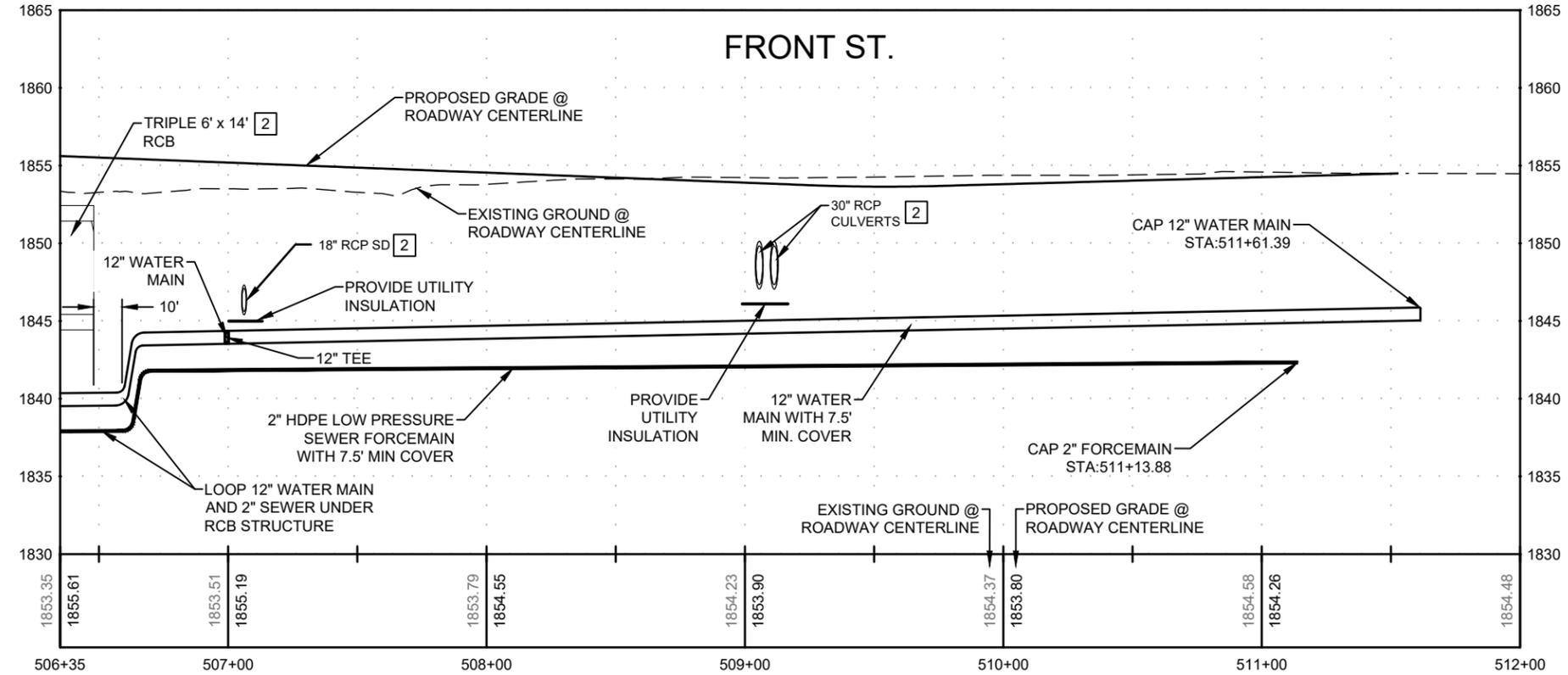
UTILITY PLAN & PROFILE
STA 501+00 TO STA 506+50

NEW UTILITIES
WILLISTON, NORTH DAKOTA

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	CPU-7-993(050)057	21707	60	2



SPEC CODE	BID ITEM	QTY	UNIT
724 0300	GATE VALVE & BOX 6IN Sta 510+38 - 30' Lt	1	EA
		Tot	1 EA
724 0314	GATE VALVE & BOX 12IN Sta 506+96 - 37' Lt Sta 507+03 - 37' Lt	1	EA
		1	EA
		Tot	2 EA
724 0636	WATER SERVICE LINE 6IN Sta 510+38 - 27' Lt to Sta 510+38 - 70' Lt	43	LF
		Tot	43 LF
724 0850	WATERMAIN 12IN PVC Sta 506+50 - 39' Lt to Sta 511+61 - 23' Lt	502	LF
		Tot	502 LF
724 6846	12IN TEE Sta 507+00 - 37' Lt	1	EA
		Tot	1 EA
724 6986	12IN x 12IN x 6IN TEE Sta 510+38 - 27' Lt	1	EA
		Tot	1 EA
724 9016	FORCEMAIN 2IN Sta 506+50 - 50' Lt to Sta 507+29 - 46' Lt Sta 507+40 - 81' Lt to Sta 511+14 - 63' Lt	76	LF
		367	LF
		Tot	443 LF
744 0100	POLYSTYRENE INSULATION BOARD Sta 507+16 - 36' Lt Sta 509+07 - 29' Lt	32	BD FT
		64	BD FT
		Tot	96 BD FT



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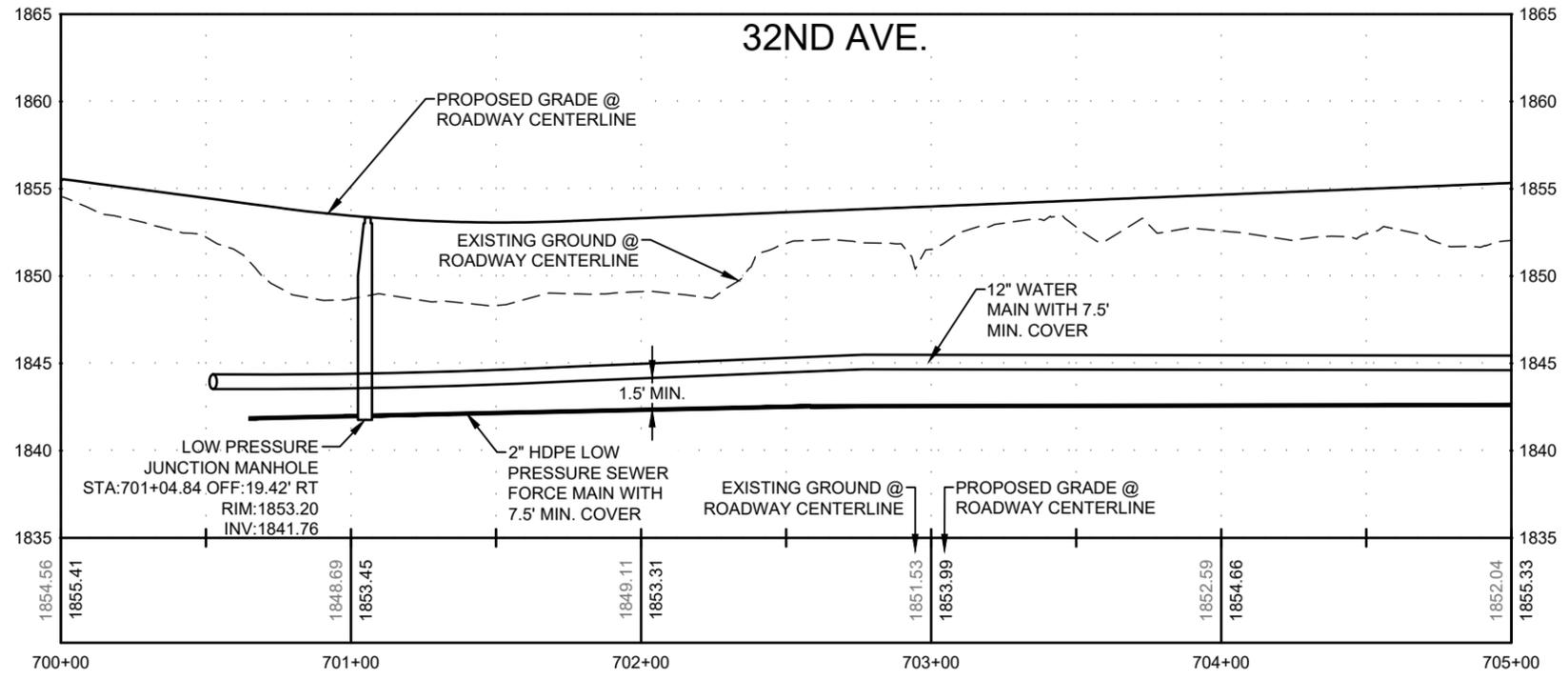
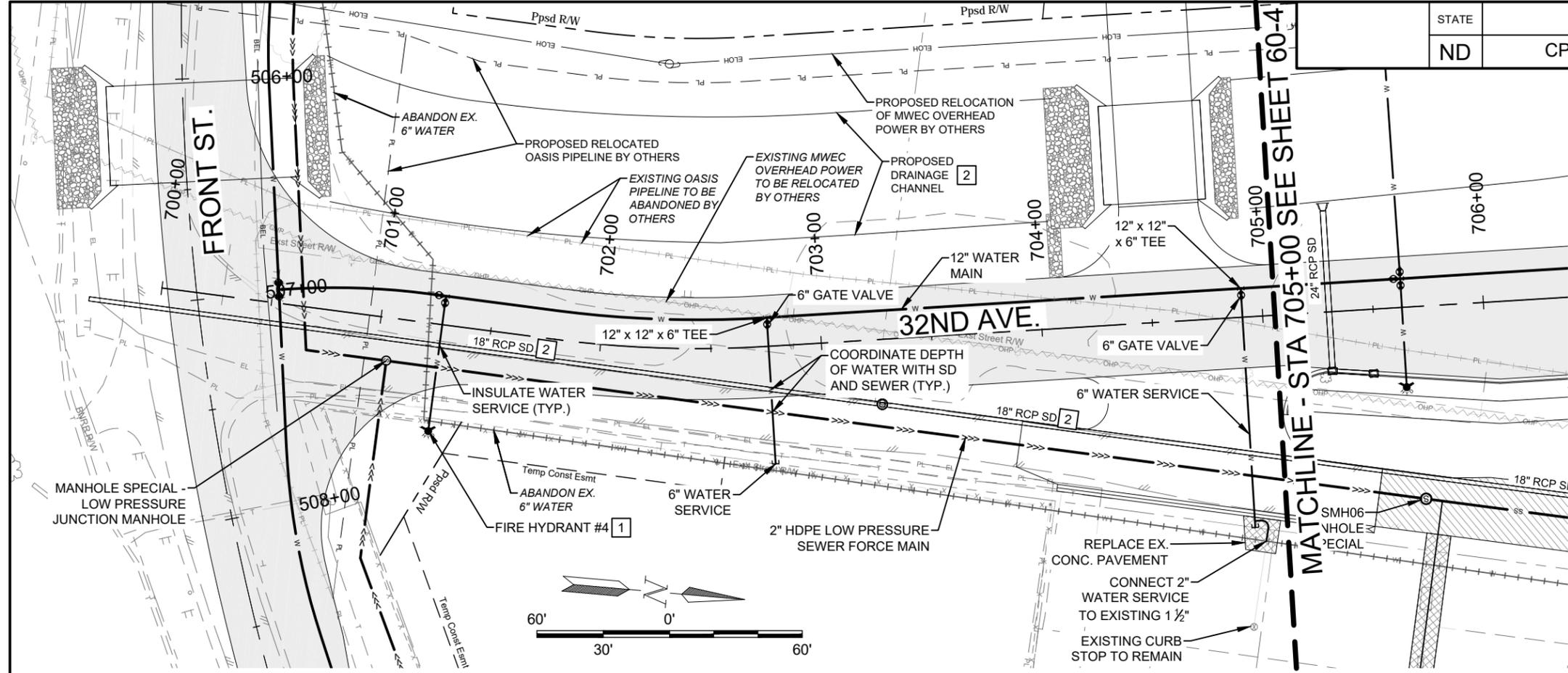
UTILITY PLAN & PROFILE
STA 506+50 TO STA 512+00

NEW UTILITIES
WILLISTON, NORTH DAKOTA

- 1 SEE HYDRANT DATA SHEET FOR FIRE HYDRANT LOCATION AND QUANTITIES, INCLUDING ASSOCIATED VALVES AND TEES
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STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	CPU-7-993(050)057	21707	60	3

SPEC CODE	BID ITEM	QTY	UNIT
722 2500	MANHOLE SPECIAL Sta 701+04 - 19' Rt (JUNCTION)	1	EA
		Tot	1 EA
724 0300	GATE VALVE & BOX 6IN Sta 702+76 - 10' Lt Sta 704+91 - 10' Lt	1 1	EA EA
		Tot	2 EA
724 0621	WATER SERVICE LINE 2IN Sta 704+91 - 92' Rt to Sta 704+95 - 102' Rt	14	LF
		Tot	14 LF
724 0636	WATER SERVICE LINE 6IN Sta 702+76 - 13' Lt to Sta 702+76 - 53' Rt Sta 704+91 - 13' Lt to Sta 704+91 - 95' Rt	66 108	LF LF
		Tot	174 LF
724 0850	WATERMAIN 12IN PVC Sta 700+53 - 6' Lt to Sta 705+00 - 13' Rt	445	LF
		Tot	445 LF
724 1110	8IN SANITARY SEWER PIPE Sta 704+58 - 65' Rt to Sta 705+00 - 73' Rt	42	LF
		Tot	42 LF
724 6986	12IN x 12IN x 6IN TEE Sta 702+76 - 13' Lt Sta 704+91 - 13' Lt	1 1	EA EA
		Tot	2 EA
724 9016	FORCEMAIN 2IN Sta 700+68 - 19' Rt to Sta 705+00 - 73' Rt	441	LF
		Tot	441 LF
744 0100	POLYSTYRENE INSULATION BOARD Sta 701+28 - 9' Rt Sta 702+76 - 20' Rt Sta 704+91 - 62' Rt	32 32 32	BD FT BD FT BD FT
		Tot	96 BD FT



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UTILITY PLAN & PROFILE
STA 700+00 TO STA 705+00

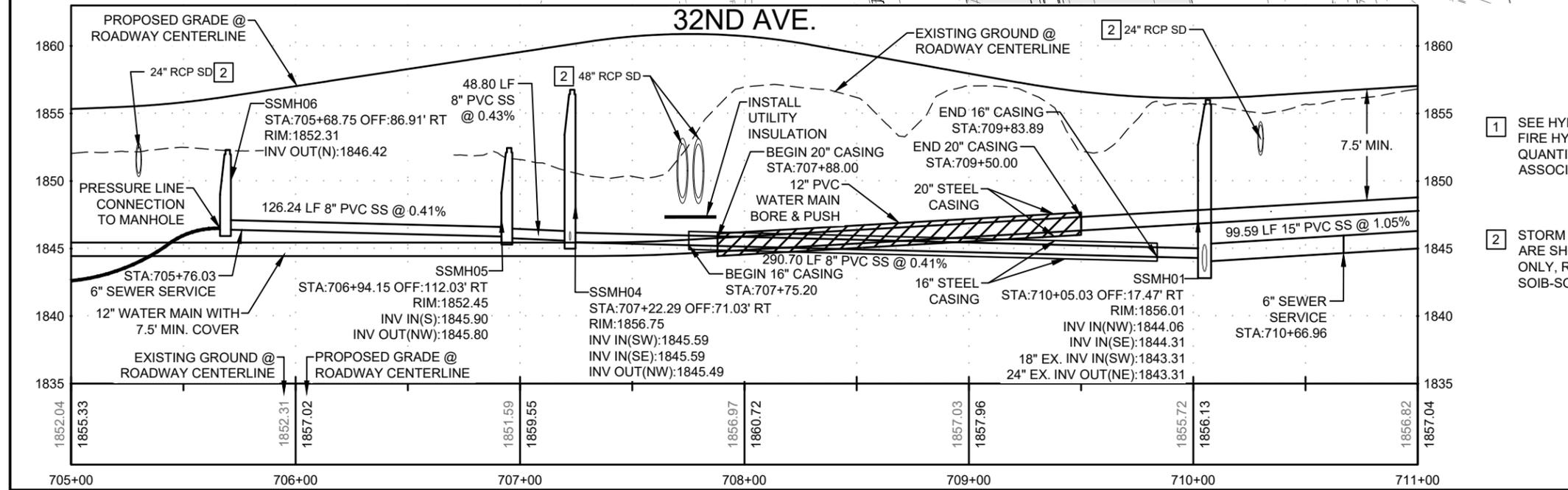
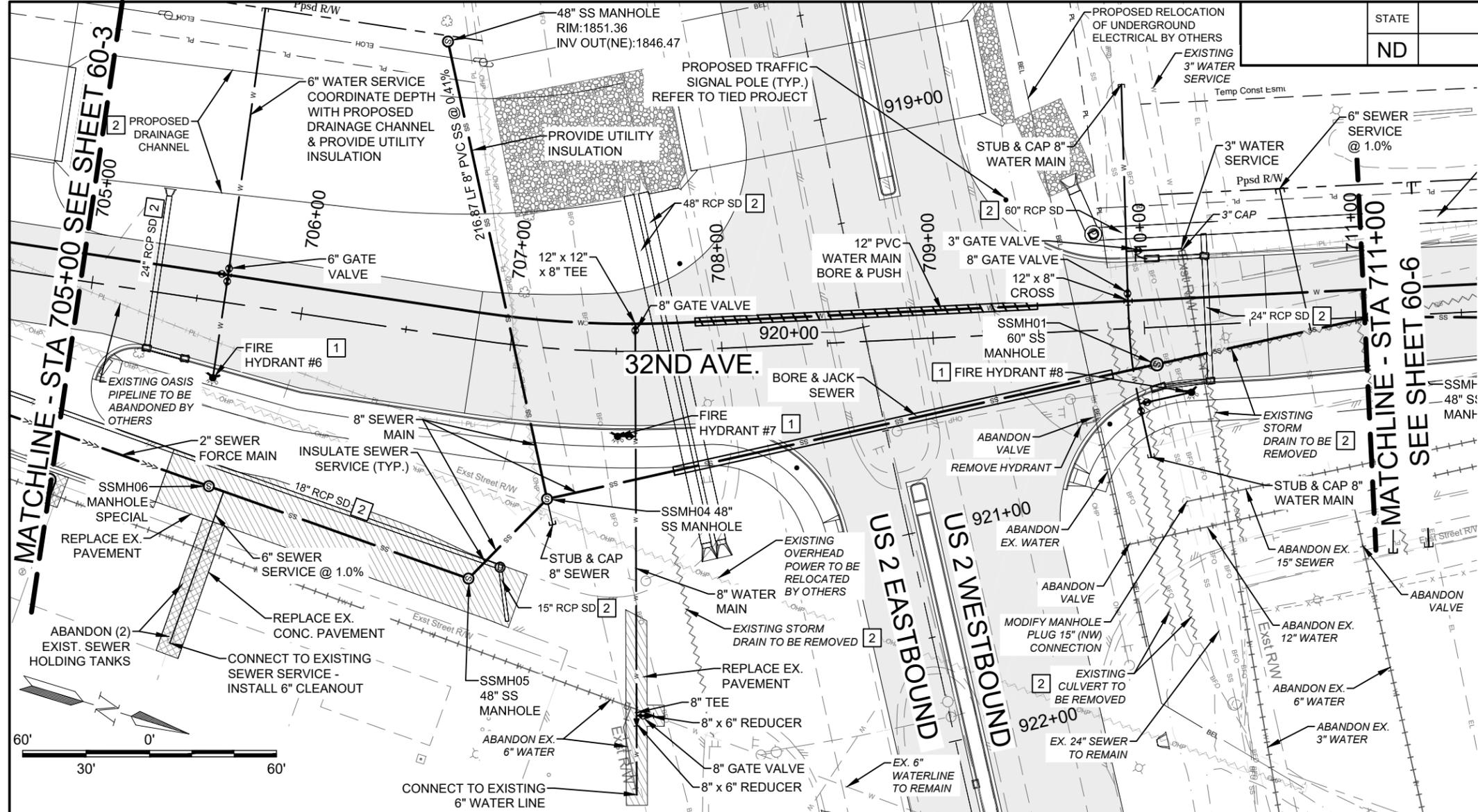
NEW UTILITIES
WILLISTON, NORTH DAKOTA

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STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	CPU-7-993(050)057	21707	60	4

SPEC CODE	BID ITEM	QTY	UNIT
722 0100	MANHOLE 48IN Sta 706+94 - 112' Rt Sta 707+22 - 71' Rt Sta 706+50 - 137' Lt	1	EA
722 0110	MANHOLE 60IN Sta 710+05 - 17' Rt	1	EA
722 2500	MANHOLE SPECIAL Sta 705+69 - 87' Rt	1	EA
724 0280	GATE VALVE & BOX 3IN Sta 709+98 - 37' Lt	1	EA
724 0300	GATE VALVE & BOX 6IN Sta 705+63 - 16' Lt	1	EA
724 0310	GATE VALVE & BOX 8IN Sta 707+59 - 10' Lt Sta 707+61 - 172' Lt Sta 709+93 - 17' Lt	1	EA
724 0430	REMOVE HYDRANT Sta 709+68 - 44' Rt	1	EA
724 0626	WATER SERVICE LINE 3IN Sta 709+93 - 37' Lt to Sta 710+19 - 37' Lt	26	LF
724 0636	WATER SERVICE LINE 6IN Sta 705+62 - 140' Lt to Sta 705+63 - 13' Lt	127	LF
724 0820	WATERMAIN 8IN Sta 707+59 - 13' Lt to Sta 707+59 - 177' Rt Sta 709+95 - 115' Lt to Sta 710+00 - 61' Rt	190	LF
724 0850	WATERMAIN 12IN PVC Sta 705+00 - 13' Lt to Sta 708+15 - 13' Lt Sta 709+50 - 13' Lt to Sta 711+00 - 13' Lt	312	LF
724 0851	BORE & PUSH 12IN PVC WATER Sta 707+88 - 13' Lt to Sta 709+50 - 13' Lt	162	LF

(SEE SHEET 60-5 FOR CONTINUATION)



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UTILITY PLAN & PROFILE
STA 705+00 TO STA 711+00

NEW UTILITIES
WILLISTON, NORTH DAKOTA

	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
	ND	CPU-7-993(050)057	21707	60	5

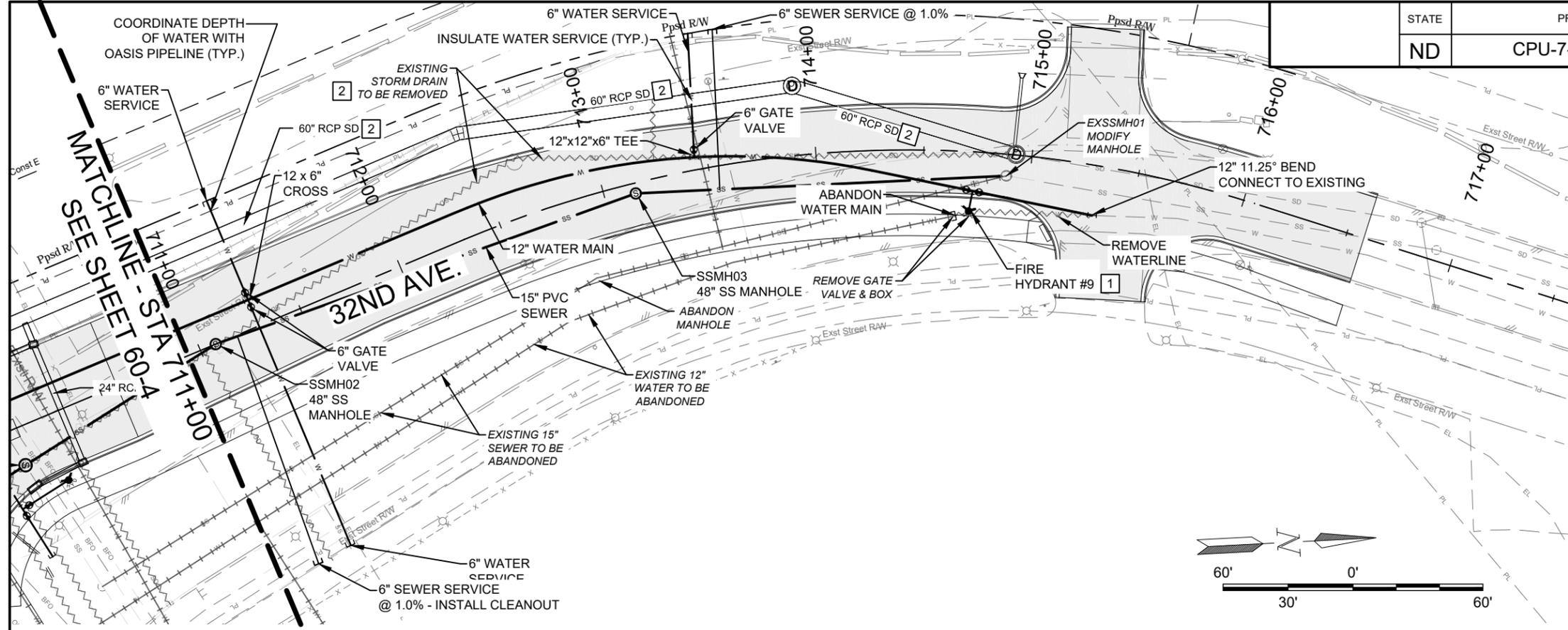
SPEC CODE	BID ITEM	QTY	UNIT
724 1095	<u>BORE SANITARY SEWER PIPE</u> Sta 707+75 - 57' Rt to Sta 709+84 - 21' Rt	212	LF
	Tot	212	LF
724 1110	<u>8IN SANITARY SEWER PIPE</u> Sta 705+69 - 87' Rt to Sta 706+94 - 112' Rt Sta 707+22 - 71' Rt to Sta 707+25 - 83' Rt Sta 706+94 - 112' Rt to Sta 707+22 - 71' Rt Sta 706+50 - 137' Lt to Sta 707+22 - 71' Rt Sta 707+22 - 71' Rt to Sta 707+75 - 57' Rt Sta 709+84 - 21' Rt to Sta 710+05 - 17' Rt	130 12 53 217 61 21	LF LF LF LF LF LF
	Tot	494	LF
724 1118	<u>15IN SANITARY SEWER PIPE</u> Sta 710+05 - 17' Rt to Sta 711+00 - 1' Rt	96	LF
	Tot	96	LF
724 1120	<u>6IN SANITARY SEWER PIPE</u> Sta 705+76 - 88' Rt to Sta 705+61 - 163' Rt Sta 710+67 - 63' Lt to Sta 710+78 - 5' Rt	76 68	LF LF
	Tot	144	LF
724 6013	<u>ABANDON VALVE BOX</u> Sta 709+89 - 102' Rt Sta 710+98 - 107' Rt Sta 709+75 - 41' Rt	1 1 1	EA EA EA
	Tot	3	EA
724 6030	<u>ABANDON WATER MAIN / SERVICE</u> Sta 707+56 - 168' Rt Sta 710+19 - 36' Lt Sta 710+61 - 299' Rt Sta 711+37 - 331' Rt	1 1 1 1	EA EA EA EA
	Tot	4	EA
724 6987	<u>12IN x 12IN x 8IN TEE</u> Sta 707+59 - 13' Lt	1	EA
	Tot	1	EA
724 7010	<u>8IN x 6IN REDUCER</u> Sta 707+59 - 177' Rt Sta 707+65 - 172' Rt	1 1	EA EA
	Tot	2	EA
724 7011	<u>8IN TEE</u> Sta 707+59 - 172' Rt	1	EA
	Tot	1	EA
724 8095	<u>12IN X 8IN CROSS</u> Sta 709+93 - 13' Lt	1	EA
	Tot	1	EA
724 9016	<u>FORCEMAIN 2IN</u> Sta 705+00 - 73' Rt to Sta 705+66, 86' Rt	67	LF
	Tot	67	LF
744 0100	<u>POLYSTYRENE INSULATION BOARD</u> Sta 705+63 - 51' Lt to Sta 705+62 - 109' Lt Sta 706+59 - 112' Lt to Sta 706+79 - 59' Lt Sta 707+00 - 103' Rt Sta 707+73 - 13' Lt	80 80 32 64	BD FT BD FT BD FT BD FT
	Tot	256	BD FT
910 0570	<u>MODIFY MANHOLE</u> Sta 710+16 - 83' Rt	1	EA
	Tot	1	EA

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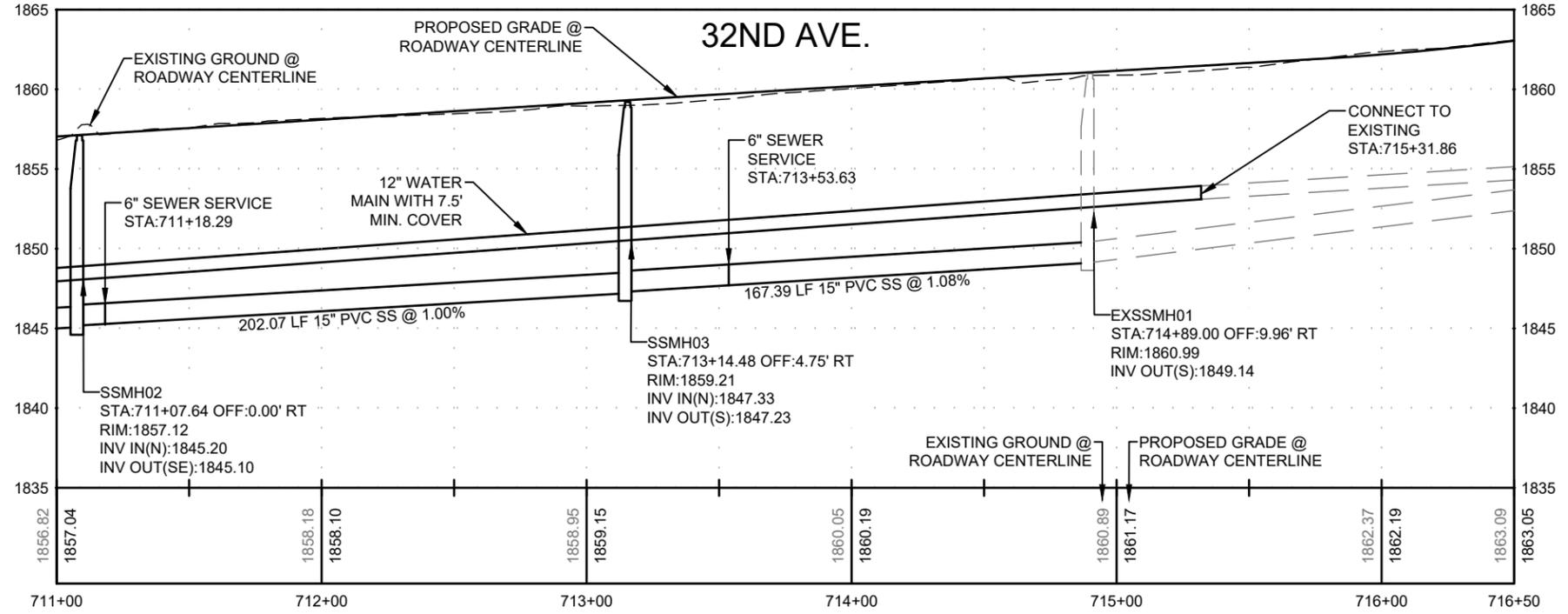
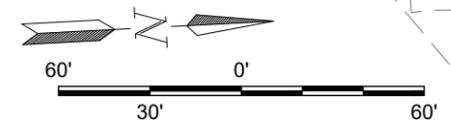
UTILITY PLAN & PROFILE
STA 705+00 TO STA 711+00

NEW UTILITIES
WILLISTON, NORTH DAKOTA

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	CPU-7-993(050)057	21707	60	6



SPEC CODE	BID ITEM	QTY	UNIT
202	0174 REMOVAL OF PIPE ALL TYPES AND SIZES Sta 714+63 - 30' Rt to Sta 715+31 - 23' Rt	63	LF
	Tot	63	LF
722	0100 MANHOLE 48IN Sta 711+08 - 0' Rt Sta 713+14 - 5' Rt	1	EA
	Tot	2	EA
722	3291 ABANDON SANITARY SEWER MANHOLE Sta 712+86 - 38' Rt	1	EA
724	0210 FITTINGS-DUCTILE IRON Sta 711+29 - 13' Lt (12IN X 6IN CROSS)	159	LBS
	Tot	159	LBS
724	0270 REMOVE GATE VALVE & BOX Sta 714+66 - 30' Rt Sta 714+73 - 28' Rt	1	EA
	Tot	2	EA
724	0300 GATE VALVE & BOX 6IN Sta 711+29 - 7' Rt Sta 711+29 - 15' Rt Sta 713+44 - 6' Lt	1	EA
	Tot	3	EA
724	0636 WATER SERVICE LINE 6IN Sta 711+29 - 13' Lt to Sta 711+29 - 110' Rt Sta 711+29 - 13' Lt to Sta 711+29 - 63' Lt Sta 713+51 - 63' Lt to Sta 713+44 - 6' Lt	99	LF
	Tot	230	LF
724	0850 WATERMAIN 12IN PVC Sta 711+00 - 11' Rt to Sta 715+32 - 23' Rt	425	LF
	Tot	425	LF
724	1118 15IN SANITARY SEWER PIPE Sta 711+00 - 1' Lt to Sta 714+89 - 10' Rt	383	LF
	Tot	383	LF
724	1120 6IN SEWER SERVICE PIPE Sta 711+18 - 1' Rt to Sta 711+12 - 112' Rt Sta 713+54 - 10' Rt to Sta 713+61 - 63' Lt	111	LF
	Tot	185	LF
724	6030 ABANDON WATER MAIN / SERVICE Sta 714+61 - 30' Rt	1	EA
	Tot	1	EA
724	6840 12IN 11.25 DEG BEND Sta 715+32 - 23' Rt	1	EA
	Tot	1	EA
724	6986 12IN x 12IN x 6IN TEE Sta 713+44 - 6' Lt	1	EA
	Tot	1	EA
744	0100 POLYSTYRENE INSULATION BOARD Sta 713+48 - 32' Lt	32	BD FT
	Tot	32	BD FT
910	0570 MODIFY MANHOLE Sta 714+87 - 11' Rt	1	EA
	Tot	1	EA

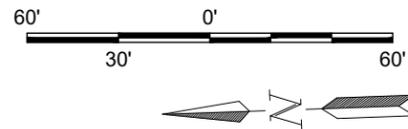


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UTILITY PLAN & PROFILE
STA 711+00 TO STA 716+50

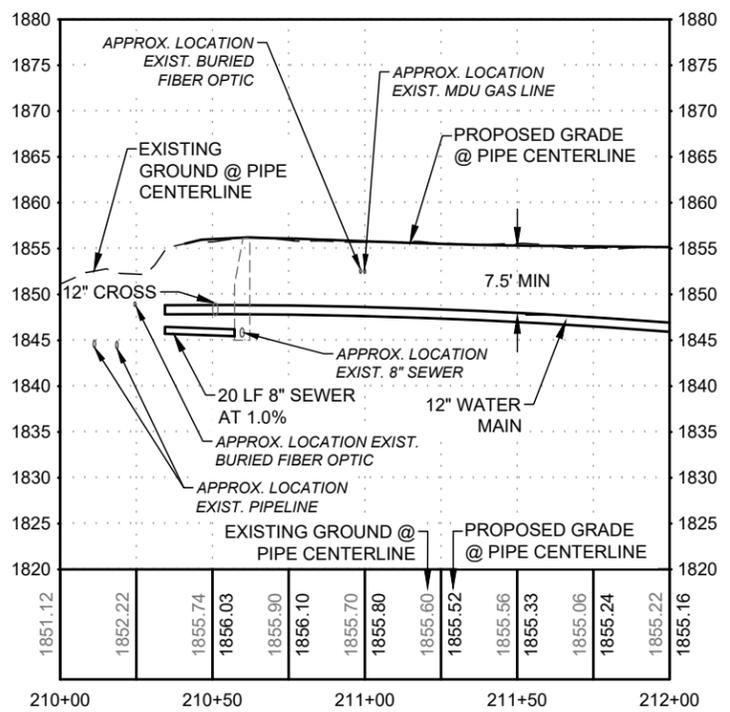
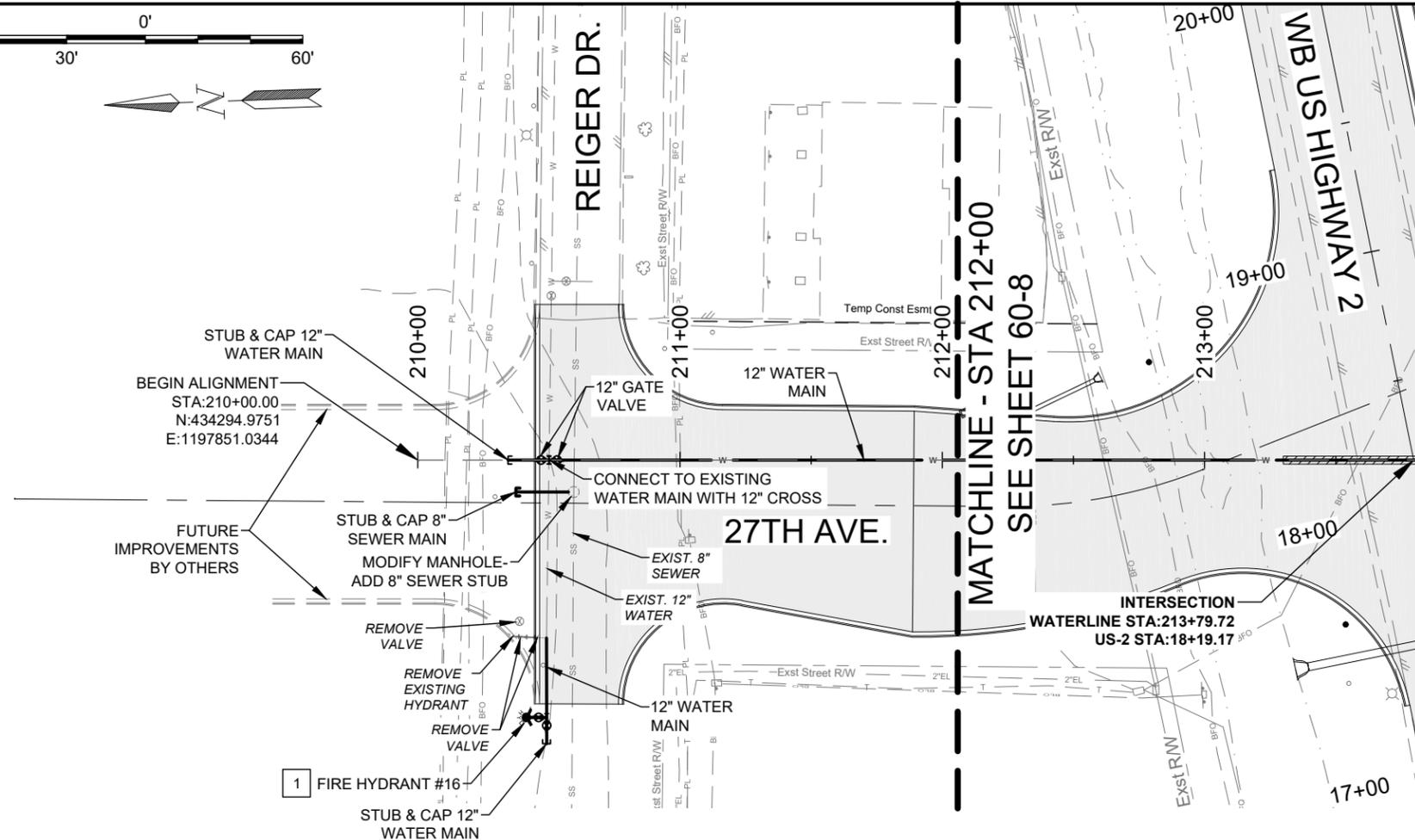
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WILLISTON, NORTH DAKOTA

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STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	CPU-7-993(050)057	21707	60	7

SPEC CODE	BID ITEM	QTY	UNIT
724 0210	FITTINGS-DUCTILE IRON Sta 210+50 - 0' Rt (12IN CROSS)	280	LBS
	Tot	280	LBS
724 0270	REMOVE GATE VALVE & BOX Sta 210+46 - 68' Rt Sta 210+39 - 68' Rt Sta 210+39 - 61' Rt	1 1 1	EA EA EA
	Tot	3	EA
724 0314	GATE VALVE & BOX 12IN Sta 210+53 - 0' Rt Sta 210+47 - 0' Rt	1 1	EA EA
	Tot	2	EA
724 0430	REMOVE HYDRANT Sta 210+36 - 67' Rt	1	EA
	Tot	1	EA
724 0850	WATERMAIN 12IN PVC Sta 210+34 - 0' Rt to Sta 210+50 - 0' Rt Sta 210+49 - 68' Rt to Sta 210+49 - 108' Rt Sta 210+51 - 0' Rt to Sta 212+00 - 0' Rt	16 40 149	LF LF LF
	Tot	205	LF
724 1110	8IN SANITARY SEWER PIPE Sta 210+37 - 12' Rt to Sta 210+57, 12' Rt	20	LF
	Tot	20	LF
910 0570	MODIFY MANHOLE Sta 210+60 -12' Rt	1	EA
	Tot	1	EA



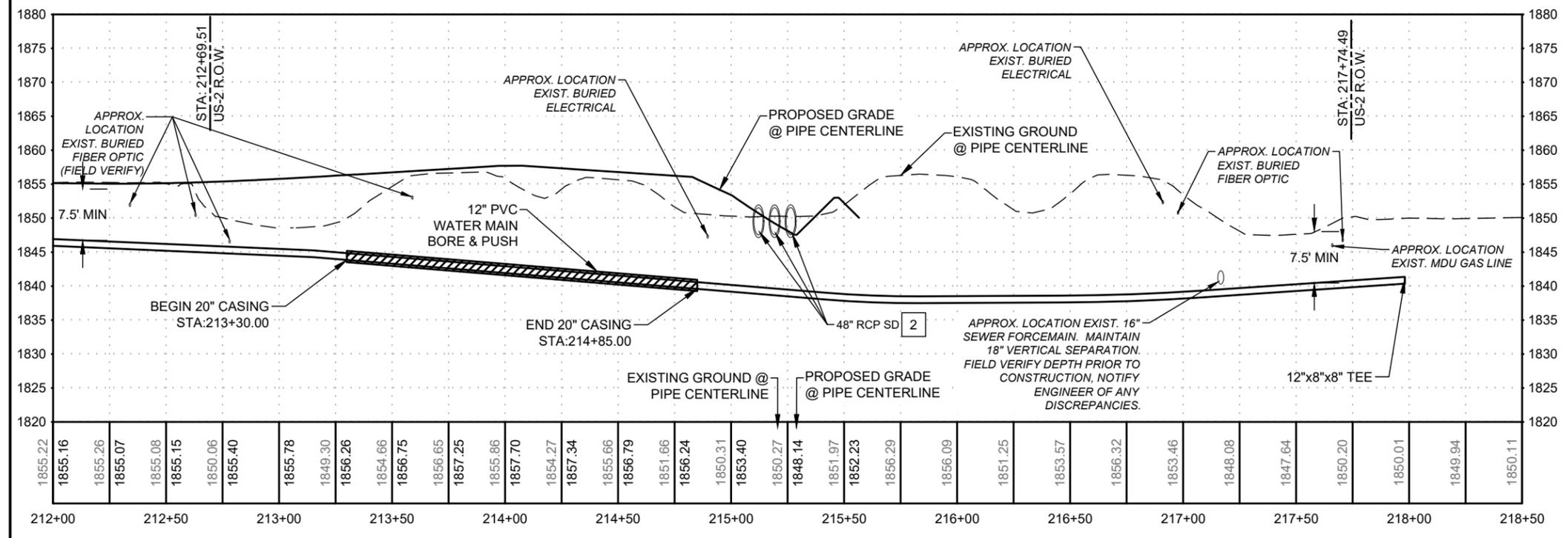
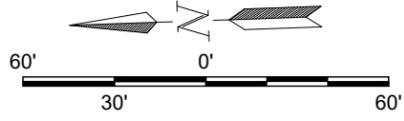
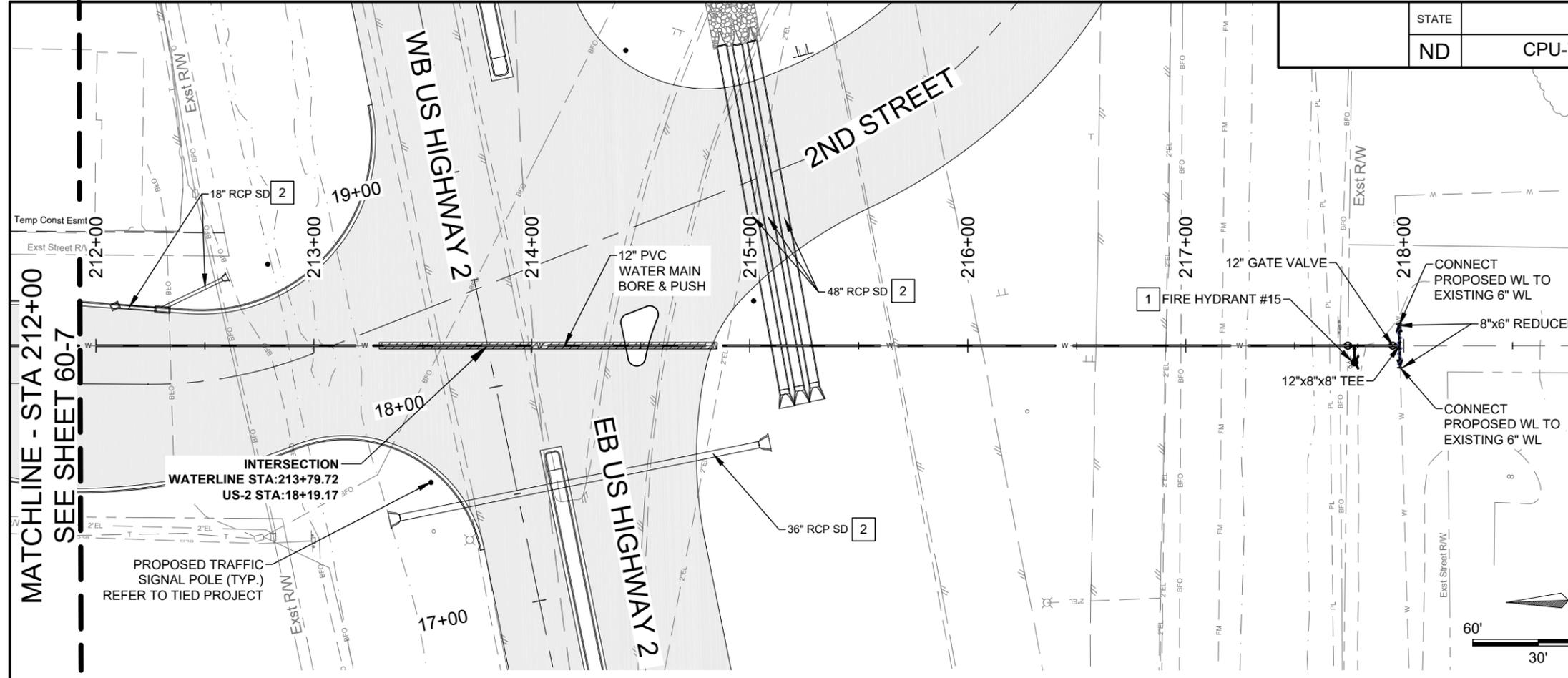
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UTILITY PLAN & PROFILE
 27TH AVE. & REIGER DR. WATER

NEW UTILITIES
 WILLISTON, NORTH DAKOTA

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	CPU-7-993(050)057	21707	60	8

SPEC CODE	BID ITEM	QTY	UNIT
724 0314	GATE VALVE & BOX 12IN Sta 217+95 - 0' Rt	1	EA
		Tot	1 EA
724 0820	WATERMAIN 8IN Sta 217+98 - 0' Rt to Sta 217+98 - 10' Lt Sta 217+98 - 0' Rt to Sta 217+98 - 10' Rt	10	LF
		Tot	20 LF
724 0850	WATERMAIN 12IN PVC Sta 212+00 - 0' Rt to Sta 213+30 - 0' Rt Sta 214+85 - 0' Rt to Sta 217+98 - 0' Rt	130	LF
		313	LF
		Tot	443 LF
724 0851	BORE & PUSH 12IN PVC WATER Sta 213+30 - 0' Rt to Sta 214+85 - 0' Rt	155	LF
		Tot	155 LF
724 6995	12"x8"x8" TEE Sta 217+98 - 0' Rt	1	EA
		Tot	1 EA
724 7010	8IN X 6IN REDUCER Sta 217+98 - 10' Lt Sta 217+98 - 10' Rt	1	EA
		1	EA
		Tot	2 EA



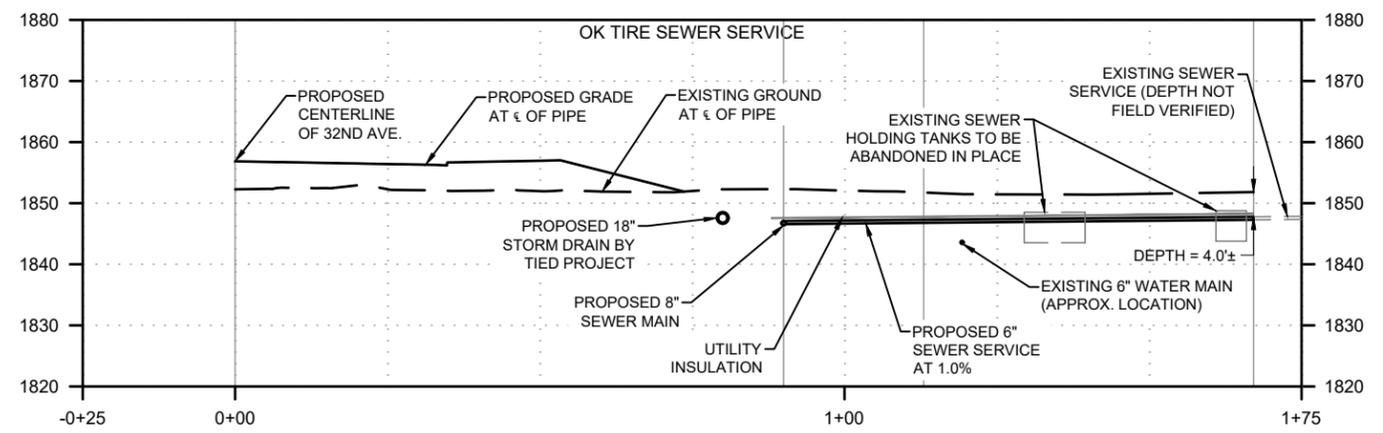
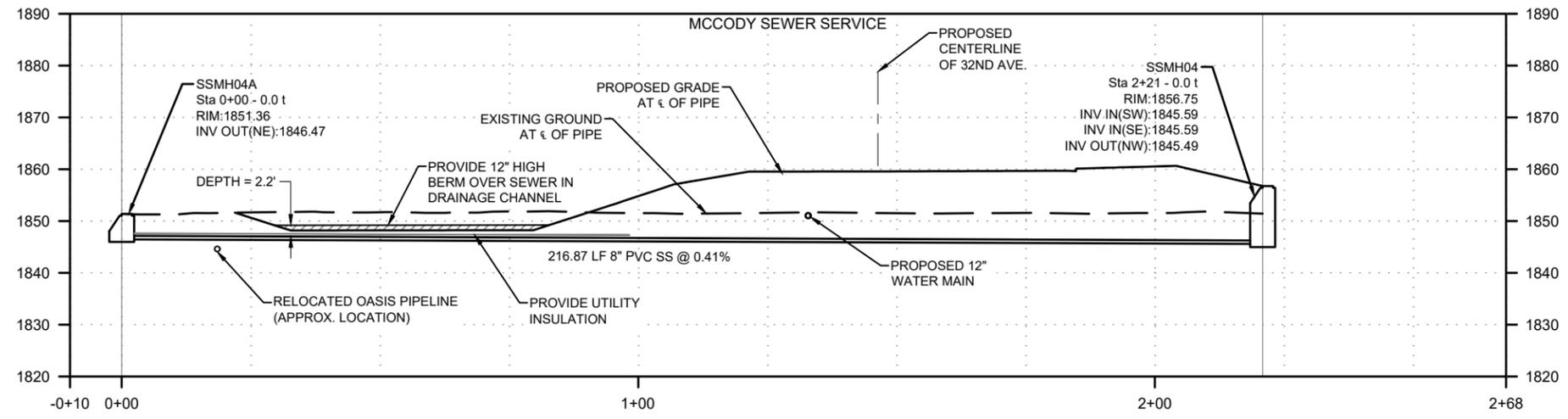
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UTILITY PLAN & PROFILE
WATER HDD UNDER US-2

NEW UTILITIES
WILLISTON, NORTH DAKOTA

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UTILITY PLAN & PROFILE
SEWER LATERAL PROFILES

NEW UTILITIES
WILLISTON, NORTH DAKOTA